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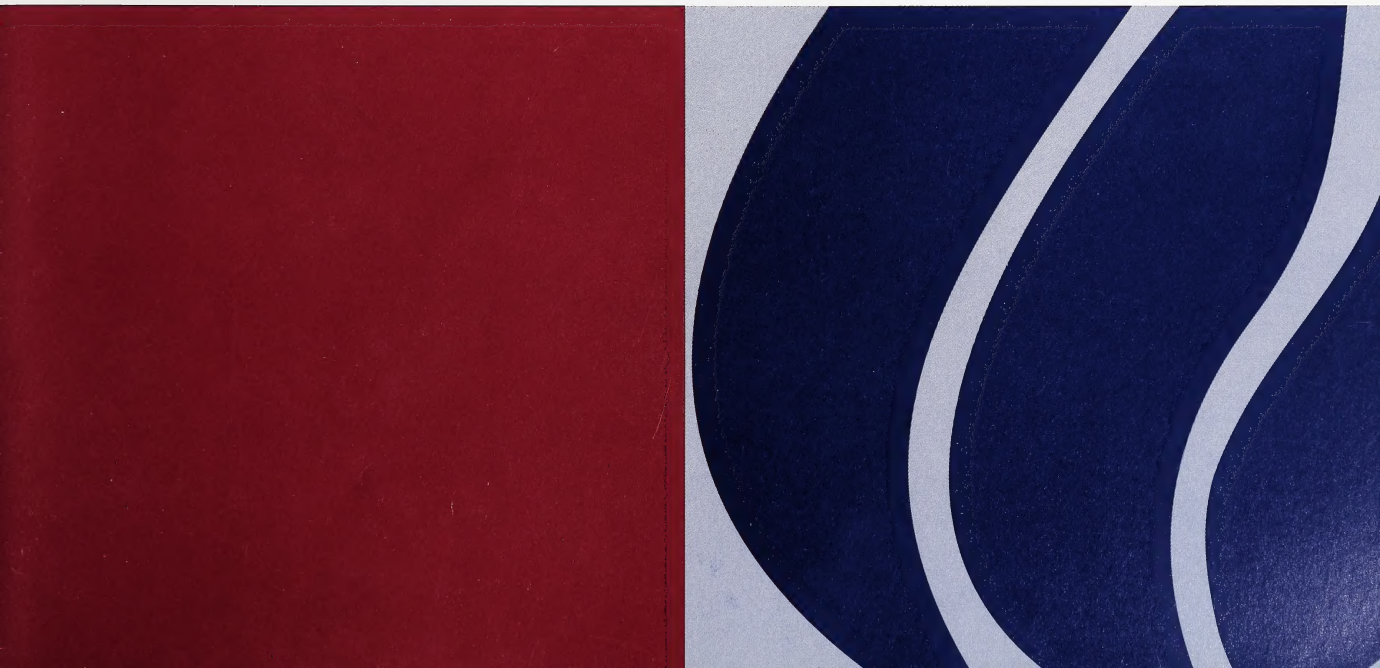
Cancer in Alberta: A Regional Picture 2004



Cancer in Alberta: A Regional Picture
January 2004

The Division of Population Health and Information of the Alberta Cancer Board presents the sixth in a series of annual reports outlining cancer trends and regional rates in Alberta.

Cancer in Alberta: A Regional Picture provides data from the Alberta Cancer Registry to provincial health professionals and planners in an effort to assist them with planning and policy setting.

Report prepared by

Ellen Murphy, Director of Prevention
Heather Bryant, Vice President, Director of PHI Division
Douglas C. Dover, Biostatistician

Data prepared by

Douglas C. Dover, Biostatistician
Herta Gaedke, Programmer Analyst

Editing and layout by

Shelley Trigg, Health Resources Coordinator

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Cancer in Alberta: A Regional Picture contains six sections:

Introduction

The Introduction comprises highlights from the report, discusses the importance of cancer in Alberta and talks briefly about the most common invasive cancers as well as cancer control activities in the province.

Provincial Overview*

This section provides information about incidence and mortality by age, gender and Regional Health Authority and discusses the impact of population on cancer. It also presents cancer trends, projections and survival statistics.

Site Specific Data*

The Site Specific Data section discusses the incidence and mortality rates for women and men for the four leading cancers. It also contains data for men and women for five additional sites.

Understanding the Graphs

This section presents a detailed description of the statistical terms used in this report.

Technical Report

The Technical Report contains details about the data collection, coding and statistical methods used to create this report.

Regional Data*

Data specific to Regional Health Authorities is located in the inside back cover pocket.

New to the Report

New to the report this year are Canadian cancer incidence and mortality rates. These rates are presented as a means of comparison between national cancer rates and rates in Alberta.

***Note on Regional Health Authorities**

The Regional Health Authority (RHA) boundaries as well as the number of RHAs has changed to 9 from 17 effective April 2003. Statistics presented in RHA specific tables in both the Provincial Overview and Site Specific Data sections of this publication are calculated using the new April 2003 boundaries. **The regional figures presented in this publication are not comparable to those in previous publications.**

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Regional Data . . . . Inside back cover pocket

Highlights

- In 2001, 11,730 Albertans were diagnosed with cancer and 4,785 people died from it.
- The increasing number of new cancer cases is mainly due to increases in the age and size of Alberta's population.
- The number of cancer cases in Alberta is expected to rise from about 11,000 cases in 2001 to about 21,000 cases in 2020.
- The most common cancers in Alberta in 2001 were prostate, breast, colorectal and lung. These four cancers accounted for 57% of new cancer cases and 52% of cancer deaths.
- Lung cancer is the leading cause of cancer-related death. It accounts for 27% of cancer deaths in men and 22% of cancer deaths in women.
- Lung cancer incidence and mortality rates for men have been declining.
- Lung cancer incidence and mortality rates for women are on the rise.
- Colorectal cancer is the second leading cause of cancer deaths in Alberta with fairly stable incidence and mortality rates.
- Prostate cancer is the leading type of cancer among men. It accounts for 32% of cancer incidence among men.
- Mortality rates for prostate cancer are slowly declining while incidence is increasing.
- Breast cancer is the leading type of cancer among women. It accounts for 31% of overall cancer incidence in women.
- Breast cancer mortality rates have been declining even though the incidence is increasing.
- Research indicates that more than 50% of cancers could be prevented through tobacco control, increased vegetable and fruit consumption, physical activity, sun safety measures and organized screening programs.

What is Cancer?

Rather than being a single disease, cancer is actually a related group of more than 100 different diseases. What is similar among these diseases is that abnormal cells within the body divide and spread without control. Normal cells grow and divide but produce only enough cells as required to keep the body healthy. Cancer cells are abnormal because they keep dividing even when new cells are not needed. This abnormal growth rate often results in a tumour. When left untreated, malignant cancer cells can invade nearby tissue and spread through the bloodstream and lymphatic system to other parts of the body.

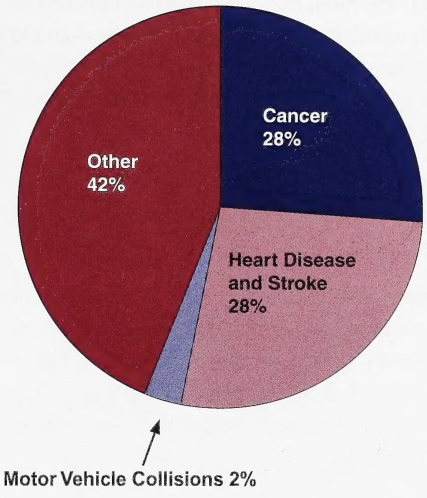
Cancer can begin at almost any site in the body and reacts differently depending on its point of origin. Cancers are most often named for the part of the body in which they originate. For example, cervical cancer begins in the cervix and colorectal cancer starts in the colon or rectum.

Most types of malignant or invasive cancer can spread to distant parts of the body. It is this ability of malignant tumours to invade and spread to other tissues in the body that makes them deadly.

Cancer is a leading cause of death in Alberta. According to the most recent statistics available from the Government of Alberta (see Figure 1), 28% of all deaths in Alberta in 2001 were attributable to cancer and 28% were caused by heart disease and stroke. Motor vehicle collisions and other causes accounted for 44% of all deaths.*

These statistics clearly illustrate the importance of cancer in Alberta and the resulting impact on our health care system, as well as the emotional, physical and psychological toll on many Albertans and their families.

Figure 1: All causes of deaths in Alberta, 2001



* Government of Alberta, Alberta Vital Statistics, *Annual Review 2001.*

Cancer in Alberta

In 2001, the most common invasive cancers in Alberta were prostate, breast, colorectal and lung. These four cancers accounted for 57% of new cancer cases and 52% of cancer deaths. (See Figures 2.1 and 2.2)

A large number of less common cancers make up the remaining number of new cancer cases and deaths.

The *other* category for new invasive cancers includes a large number of types of cancers each representing very small segments of the total. The *other* category for cancer deaths includes a large number of cancers that account for smaller percentages of cancer deaths.

Three cancers—stomach, brain and pancreas—were responsible for 12% of the deaths in 2001 but were not individually identified in Figure 2.1 because they accounted for less than 2% each of newly diagnosed cases. These cancers have a poor prognosis and, as a result, make a relatively large contribution to mortality figures compared to other cancers. Lung cancer also has a poor prognosis. It accounts for 12% of new cases but an alarming 23% of cancer deaths.

Incidence and mortality rates for non-melanoma skin cancer (NMSC) are not included in any of the statistics presented in this document. Although approximately 30% of the malignant cancers diagnosed among Albertans each year are NMSC, these tumours are not included because they are rarely life threatening.

Figure 2.1: New invasive cancers by site, Alberta, 2001

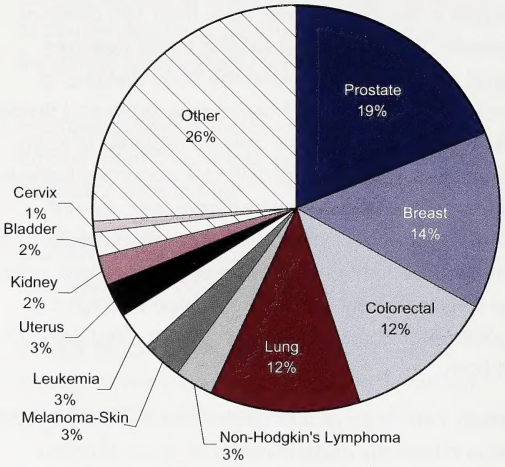
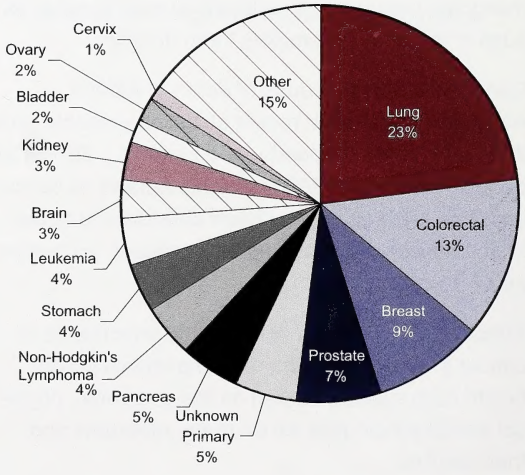


Figure 2.2: Cancer deaths by site, Alberta, 2001



11,730 Albertans were newly diagnosed with invasive cancer, and 4,785 died from cancer in 2001.

Alberta's Regional Health Authorities

Alberta has nine Regional Health Authorities (RHAs) that are responsible for hospitals, continuing care facilities, community health services and public health programs in Alberta. They deliver health services in the regions and work with communities to deliver health services to local residents.

Their mandate is to promote health within the regions, respond to regional health needs and report on performance to the Minister. They work in conjunction with the Alberta Cancer Board, the provincial cancer health authority, to provide cancer control for all Albertans.

> Cancer affects all Albertans.

Figure 3: Alberta's Regional Health Authorities as of April 2003

Cancer Control Activities in Alberta

The Alberta Cancer Board is the provincial health authority that operates cancer facilities and programs in Alberta. Services include cancer prevention, early detection, diagnosis, treatment, research and education. Also included in this role is coordinating, in cooperation with others, the planning and delivery of provincial cancer initiatives.

As part of this mandate, the Alberta Cancer Board operates

Cancer treatment and research facilities

- Cross Cancer Institute in Edmonton
- Tom Baker Cancer Centre in Calgary

Associate Cancer Centres

- Grande Prairie, Lethbridge, Red Deer and Medicine Hat

Community Cancer Centres (in partnership with Regional Health Authorities)

- RHA 3 in Canmore and High River
- RHA 4 in Drayton Valley and Drumheller
- RHA 5 in Camrose and Lloydminster
- RHA 7 in Hinton, Barrhead and Bonnyville
- RHA 8 in Peace River
- RHA 9 in Fort McMurray

Division of Population Health and Information

The division operates the following cancer prevention, screening and surveillance initiatives:

- *Cancer prevention outreach* provides a variety of services to Regional Health Authorities including cancer information, assistance with program and policy development and links to resources.
- *Screen Test*: Alberta Program for the Early Detection of Breast Cancer is a screening mammography and breast health education program with fixed-site offices in Calgary and Edmonton and mobile mammography services throughout the province (Fig. 4).
- *Alberta Cervical Cancer Screening Program* (ACCSP) coordinates strategies to improve existing cervical screening services and increase women's participation in screening. Full implementation across Alberta is expected to be completed by 2005 - 2006.

Figure 4: *Screen Test* Mobile Mammography Sites

- *Alberta Cancer Registry* operates a computerized database that tracks all cancer cases and deaths in the province. Researchers and health professionals use this population-based data to monitor cancer trends, and plan appropriate control strategies and obtain data for clinical research.
- *Population health research* conducts epidemiologic research into population-based trends in cancer incidence, morbidity and mortality, the causes of cancer, prevention strategies and the early detection of cancer.

A list of prevention and screening resources is provided on pages 44 and 45 of this report.

Surveillance

Public health surveillance, as defined by the U.S. Centers for Disease Control and Prevention (CDC), is "the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link in the surveillance chain is the application of these data to prevention and control."*

The Alberta Cancer Board collects information about cancer in the province of Alberta through the Alberta Cancer Registry, a database that tracks all cancer cases and deaths in the province. The overall purpose is to assess trends in cancer as well as the risk factors for disease prevention and cancer control.

The population of Alberta will almost double between 1984 and 2020.** This increase in population means that even if the risk of developing cancer does not change, there will be more cases of cancer.

Another factor to consider is the age structure of the population over time. Because cancer is more common in people over the age of 50, and Alberta's population is aging, the number of cancer cases will continue to grow, thus increasing the overall burden of cancer on our health care system.

The effect of "baby boomers" (people born between the years of 1945 and 1966) on the province's population will have a direct effect on the number of cancer cases as this large population moves into the age group at high risk for cancer.

Figure 5 indicates that the percentage of the population over the age of 65 will double from 7.7% to 15.1% in just 35 years.

On a regional level, these numbers show that there is significant variation in the age structure among Regional Health Authorities. For example, in RHA 9, 2.5% of the population were over 65 years of age in 2000, compared to 15.4% in RHA 5. These figures indicate that even if cancer rates were identical in RHA 5 and 9, there would be a higher number of cancer cases expected in RHA 5 because overall, residents in that area of the province are older.

> The proportion of the population over the age of 65 will double between 1984 and 2020.

Figure 5: Alberta Population Distribution Over Time

	1984		2000		2020	
RHA	Population	% over 65	Population	% over 65	Population	% over 65
1	136,049	11.1	149,768	13.1	202,331	15.4
2	80,803	10.3	93,661	12.9	113,880	16.0
3	746,297	6.7	1,030,651	9.0	1,459,996	15.0
4	232,982	9.8	285,635	11.5	393,366	15.3
5	104,933	13.8	107,626	15.4	122,850	17.6
6	796,650	7.0	929,593	10.4	1,292,515	15.9
7	149,511	8.3	173,298	9.7	215,923	14.7
8	109,086	6.6	126,350	8.1	159,335	13.0
9	52,546	1.8	61,677	2.5	120,070	7.0
All	2,408,857	7.7	2,958,259	10.1	4,080,266	15.1

* Centers for Disease Control. Comprehensive Plan for Epidemiologic Surveillance. Atlanta, GA: CDC, 1986.

** Alberta Health and Wellness. Population Projections for Alberta and its Health Regions: 2000 - 2030. Edmonton, AB, 2001.

Incidence

Incidence describes the frequency of new cancer cases during a period of time and is therefore a good way to evaluate the impact of disease. In this report, incidence is expressed as either the number of new invasive cases diagnosed in a year or as an incidence rate (the number of cases per 100,000 population in a one-year period).

Incidence rates are important because when they are age standardized, they enable comparisons over time or between populations that may differ in factors such as size or age distribution.

Incidence can be impacted by breakthroughs in prevention, research or screening. While the goal of prevention interventions is to decrease incidence, there can be a lag time of 20 to 30 years before a resulting change in incidence is observed.

Number of New Invasive Cases

Comparing the diagrams on this page shows that while the incidence rates are very gradually increasing (Figure 6), the number of new invasive cases diagnosed each year is increasing dramatically (Figure 6.1).

Figure 6.1 also shows the proportions of the most commonly occurring cancers. Half of the total number of cancer cases in women is made up of breast, lung and colorectal cancers. For men, prostate, lung and colorectal cancers account for more than half of all cases diagnosed each year.

Figure 6: Age-Standardized Incidence Rates (ASIR) for All Invasive Cancers by Sex, Alberta (1981 - 2000)

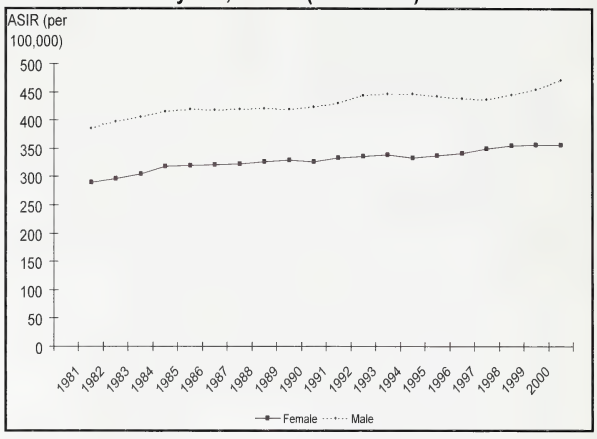
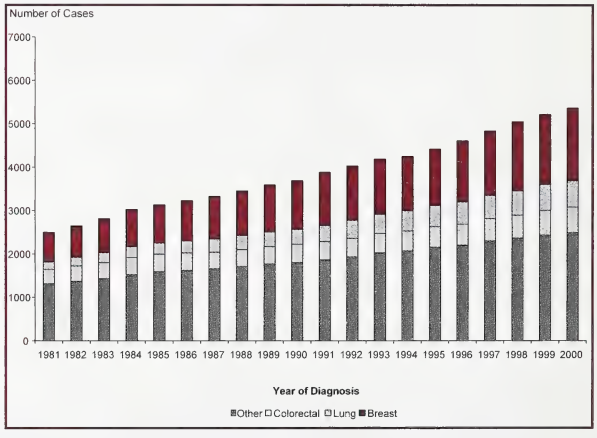
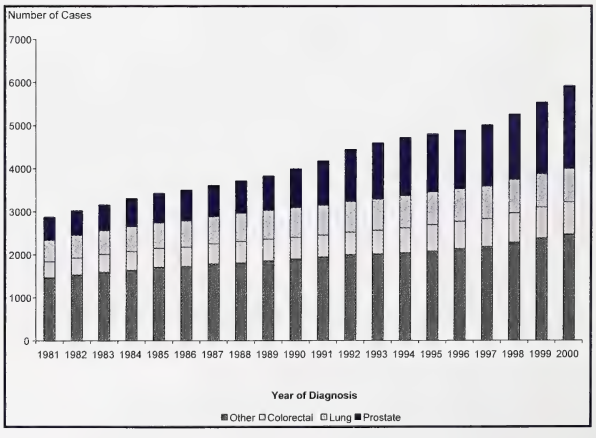


Figure 6.1: Total Number of New Cases of Invasive Cancer by Sex and by Site, Alberta (average of 1981 - 2000)

Females



Males



Age-Specific Incidence Rates

Age-specific incidence rates show the number of cancer cases per 100,000 people for an age group. (The age groups used were 0-14, 15-44, 45-54, 55-64, 65-74, 75-84 and 85+.) The general trend for the four most commonly occurring cancers (prostate, breast, colorectal and lung) is that with increasing age, the likelihood of developing cancer increases.

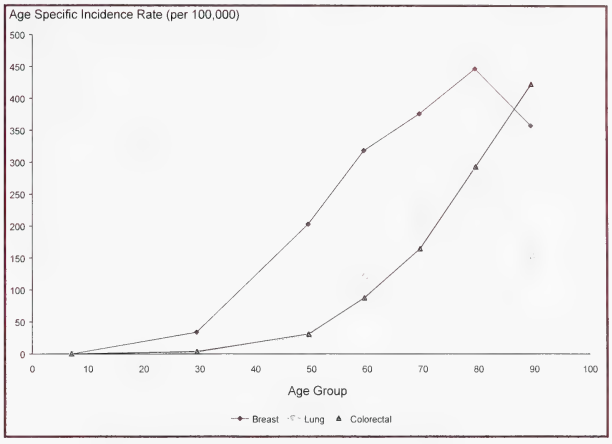
Figure 7 shows that the trends among cancers differ. For example, lung, prostate and colorectal cancers have very low rates up to age 45; whereas, breast cancer shows an appreciable incidence by age 45. For lung, breast and prostate cancer, the incidence rates decrease after age 75, but rates for colorectal cancer increase.

Part of the reason rates for lung, breast and prostate cancer decline after age 75 is because people die from other causes before being diagnosed with cancer. The reasons for the increase in colorectal cancer rates after age 75 are not well understood.

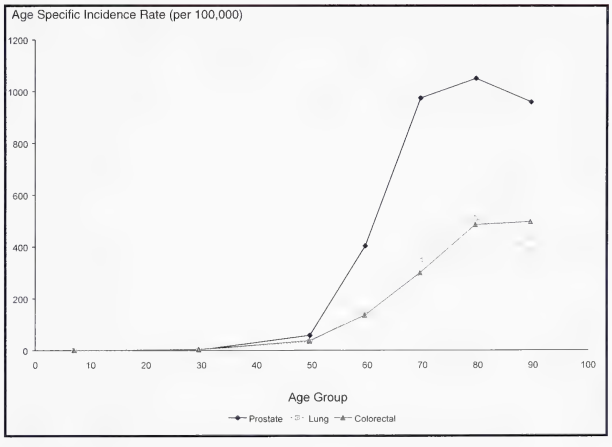
Some less common cancer sites do not exhibit the same pattern of increasing incidence with increasing age.

Figure 7: Age-Specific Incidence Rates for Invasive Cancer by Sex, Alberta, 2000 (average of 1999 - 2001)

Females



Males



Mortality

Mortality describes the number of deaths due to cancer during a period of time. Mortality rates and number counts measure the risk of dying from a particular disease and give some indication of the burden that disease places on society. Prevention, screening, and early detection programs as well as some treatment options can affect mortality.

As shown in Figure 8, the overall mortality rates for cancer are fairly stable in both men and women. The increasing number of deaths each year is primarily due to changes in the population size and age structure.

Lung cancer is the leading cause of cancer deaths for both men and women. Breast cancer is the second leading cause among women, while prostate is the second leading cause among men. But if the data for women and men is combined, colorectal cancer ranks as the second leading cause of cancer death behind lung cancer.

Figure 8: Age-Standardized Mortality Rates for All Invasive Cancer by Sex, Alberta (1988 - 2000)

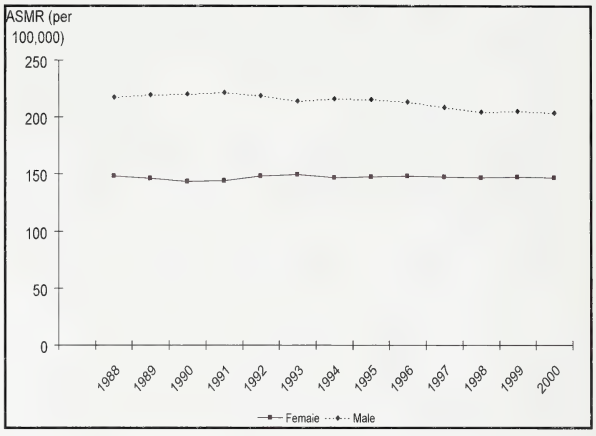
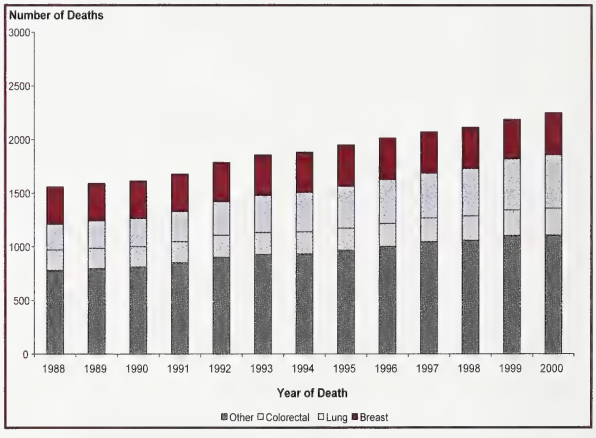
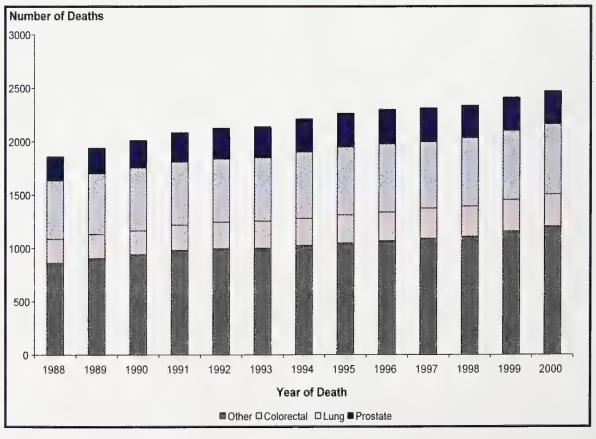


Figure 8.1: Total Number of Cancer Deaths of Invasive Cancer by Sex and by Site, Alberta (average of 1988 - 2000)

Females



Males



Age-Specific Mortality Rates

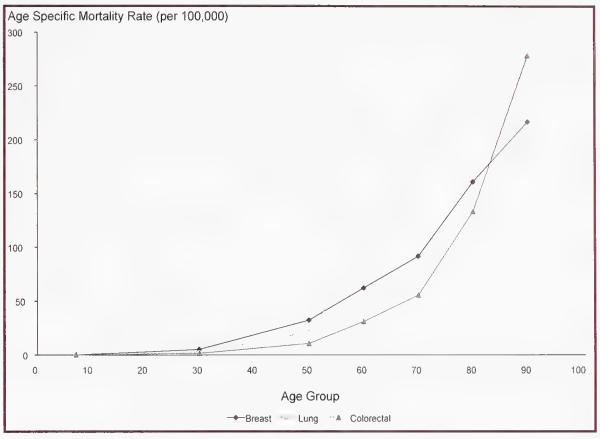
Age-specific mortality rates indicate the number of cancer deaths per 100,000 people for each age group.

Figure 9 shows that mortality rates increase as people age. These rates are attributable to the increased incidence of cancer with age. Decreases over age 75 reflect the competing causes of mortality.

With most types of cancer the general rates in mortality are similar to the incidence rates. The exceptions among the four most commonly occurring cancers are prostate and breast cancer where the incidence rates are far higher than mortality rates since these cancers have better survival rates than many other cancers.

Figure 9: Age-Specific Mortality Rates for Invasive Cancer by Sex, Alberta, 2000 (average of 1999 - 2001)

Females



Males

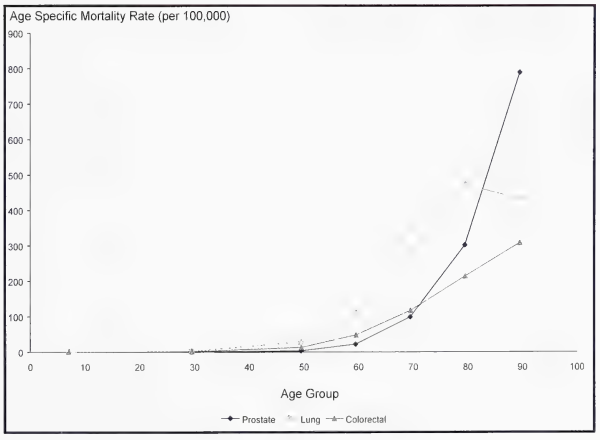
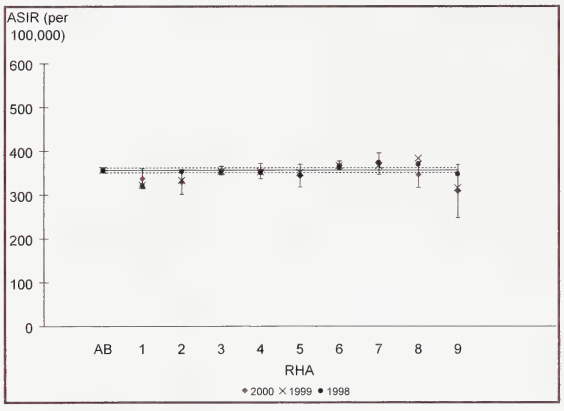


Figure 10.1: Age-Standardized Incidence Rates (ASIR)* by RHA with 95% Confidence Intervals for All Invasive Cancers, Alberta, 2000 (average of 1999 - 2001)**

Females



Males

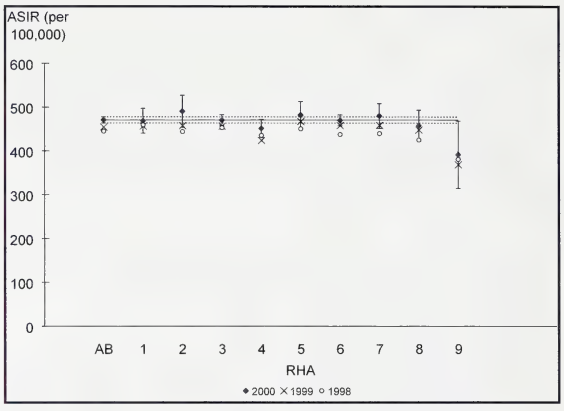
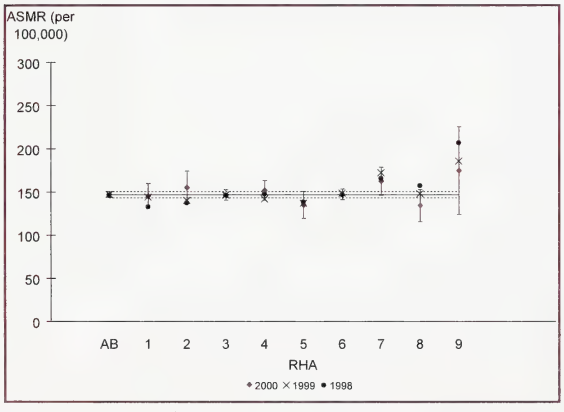
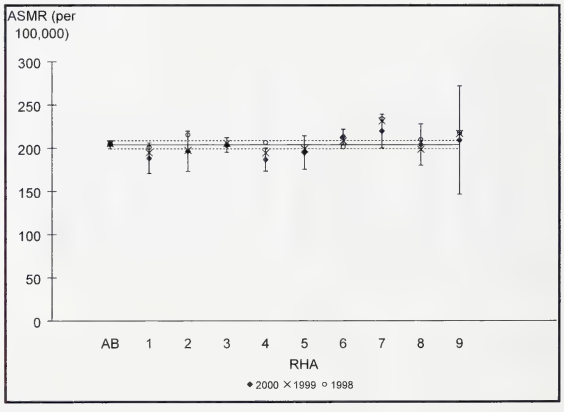


Figure 10.2: Age-Standardized Mortality Rates (ASMR)* by RHA with 95% Confidence Intervals for All Invasive Cancers, Alberta, 2000 (average of 1999 - 2001)**

Females



Males



Incidence and Mortality Rates by RHA

Age-standardized incidence and mortality rates vary little from year-to-year within most RHAs. Some variation is observed among RHAs, especially RHAs with smaller populations, but even with three-year averages, small numbers may result in erratic estimates.

Although there is some variation between regions and some fluctuations year to year within regions, none of the regions display incidence or mortality rates that are statistically different from the provincial average. See page 38 for a detailed explanation of incidence and mortality rates by RHA.

* Three-year moving averages are age-standardized to the 1991 Canadian population.
**Excluding non-melanoma skin cancer

Cancer Trends

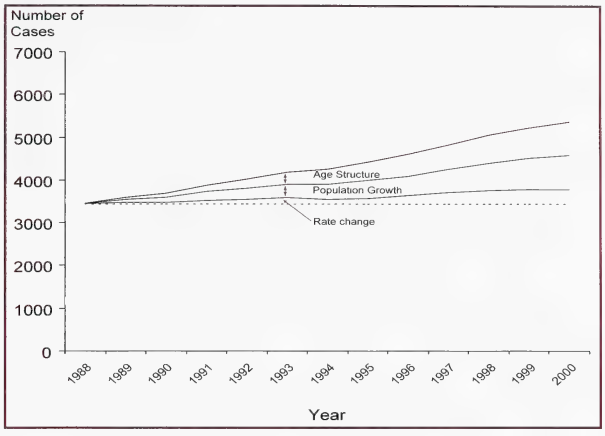
The graphs show that changes in population size and age structure are the most important factors with regard to the increasing impact of cancer in Alberta. As the population continues to age and grow, there will be a concurrent rise in the number of cancer cases each year.

Changes in Alberta's population and age structure since 1988 have affected trends in the total number of cancer cases. The dotted line on the graphs represents the number of cases that occurred in 1988. The lowest line represents the total number of cases that would have occurred each year if the cancer incidence rates alone had changed but the population had remained the same as in 1988. The centre line represents the number of cases that would have occurred each year if the yearly rates had occurred within a population that grew larger but maintained the same age distribution as in 1988. The top line represents the number of cases that actually occurred. This line reflects the combined impact of rate change, population growth and aging population.

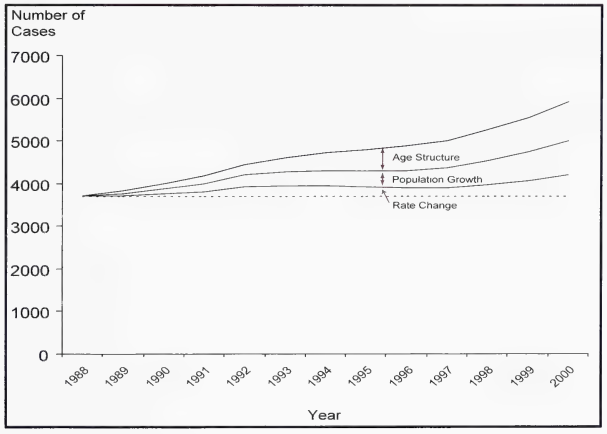
In Alberta, the number of cases is increasing mainly due to the population size and age structure, because the overall rates of cancer have remained relatively stable.

Figure 11: Trends in the Number of New Cases Attributed to Cancer Rate, Population Growth and Population Age Structure, All Cancers, All Ages (1988 - 2000)

Females



Males



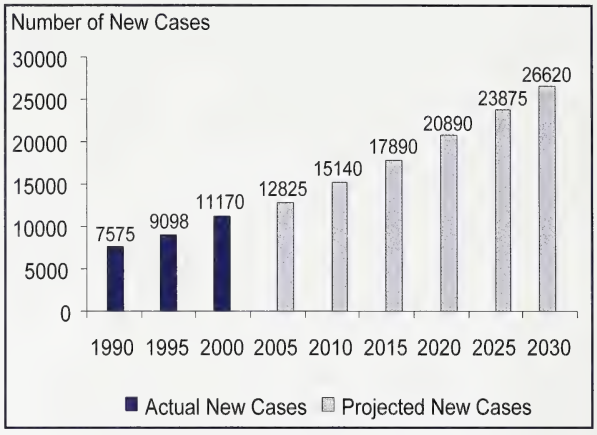
Projections

The projected number of new cancer cases in Alberta for 2005 - 2020 is represented in Figure 12.

These projections assume that the age-specific rates of cancer incidence witnessed during the last five years in Alberta will continue into the future. Population estimates from Alberta Health and Wellness* have been used in the projections.

Taking into consideration age structure and population growth while assuming constant cancer rates, the Alberta Cancer Board has estimated that a dramatic increase in cases can be expected for the next 20 years.

Figure 12: Actual and Projected Number of New Cases of Invasive Cancer, Alberta, 1990-2030



The number of new cancer cases will almost double between 2000 and 2020.

* Alberta Health and Wellness. Population Projections for Alberta and its Health Regions: 2000 - 2030. Edmonton, AB, 2001.

Cancer Survival

Survival rates are important not only because they indicate the proportion of people who will be alive at a given point after they have been diagnosed with cancer, but also because they may allow the effectiveness of cancer control programs to be evaluated.

The number of years a person survives after being diagnosed with cancer depends on several factors: site of the cancer, stage of cancer at diagnosis, type of cells affected, age at diagnosis and treatment.

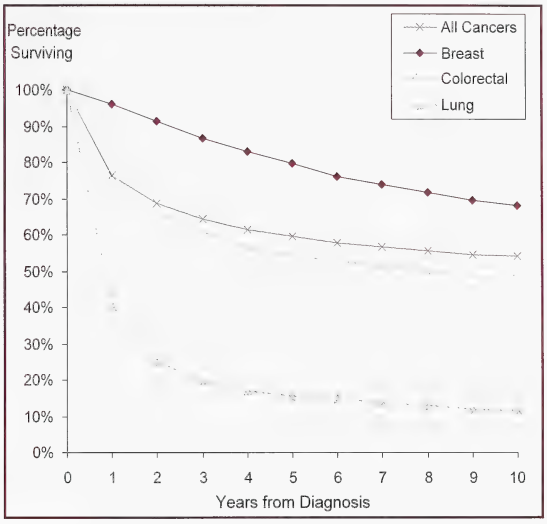
Relative survival rates are determined by comparing the death rates in cancer patients with the death rates in the general population.

Survival rates vary dramatically among sites. The survival rates for prostate and breast cancer are much higher than those for colorectal cancer. In turn, survival rates for colorectal cancer are better than the survival rates for lung cancer, which are the lowest for the top sites.

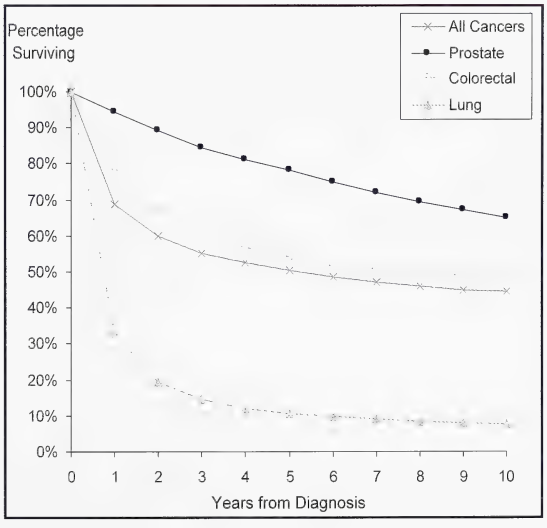
Incidence, mortality and survival rates all help to determine the burden of cancer in our society. These figures give us an overall picture of how many people are likely to develop cancer, how many will survive the disease and how many will die from it. These figures may also give some indication of how changes in detection programs and new technologies in treatment affect cancer statistics in the province as a whole.

Figure 13: Relative Survival Curves, Alberta, (cases diagnosed 1985 - 1993)*

Females



Males



* Those cases not known to be dead were censored either at the date they left the province or December 21, 1999.

Lung Cancer - Incidence

Lung cancer incidence numbers and rates have been increasing dramatically over the past two decades. The number of lung cancer cases among women in the year 2000 is 3.5 times higher than the number of cases in 1981. This rising trend reflects an increase in smoking behaviour among women 20 to 30 years ago when women were actively targeted by tobacco advertising. The provincial trends are very similar to the national trends in lung cancer incidence.

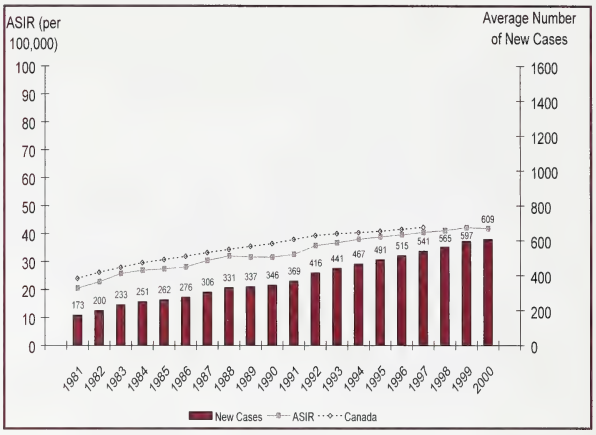
Educational and policy efforts have been effective. This is confirmed by women's smoking rates that peaked at about 30% in the late 1960s, leveled off during the 1970s and eventually declined to about 24% in 2002.* This reduction in smoking should lead to a decrease in lung cancer incidence among women in the future but only if current efforts persuade smokers to quit and prevent young women from ever starting to smoke.

The declining trend in lung cancer incidence among men reflects their decreasing smoking prevalence that began 20 to 30 years earlier. This decline in smoking prevalence is continuing and should be reflected as further reductions in future lung cancer incidence rates. Although men's incidence rates are decreasing while women's are increasing, you will notice that the overall numbers and rates for men are still much higher than for women because of higher peak smoking prevalence.

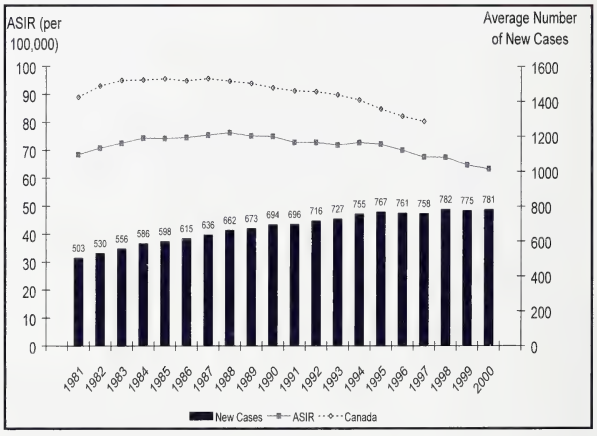
Unfortunately, the reduction in lung cancer rates in men is counterbalanced by the influence of an aging population, resulting in a steadily increasing number of lung cancer cases being diagnosed. The large number of cases occurring in both men and women for a largely preventable cancer continues to be a major cause for concern and have a major impact on the health care system.

Figure 14: Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Lung Cancer, Alberta, (1981 - 2000)*****

Females



Males



* Health Canada, *Canadian Tobacco Use Monitoring Survey*, (Ottawa, February - December 2002) Table 3.

**Three-year moving averages are age-standardized to the 1991 Canadian population.

***For comparative purposes, age-standardized mortality rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1998.

Lung Cancer - Mortality

Since 1995, lung cancer has been the leading cause of cancer deaths for Alberta women and has long been the leading cause of cancer deaths for Alberta men.

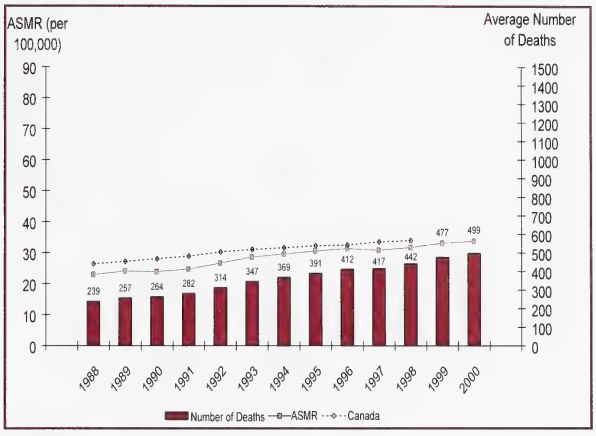
The mortality trends for lung cancer for both women and men are very similar to their corresponding incidence trends. Lung cancer has a high fatality rate; therefore, the number of deaths per year is almost as high as the number of new cases.

Note that even though mortality rates among men are falling overall, they are still higher than mortality rates for women due to higher smoking prevalence 30 years ago among men.

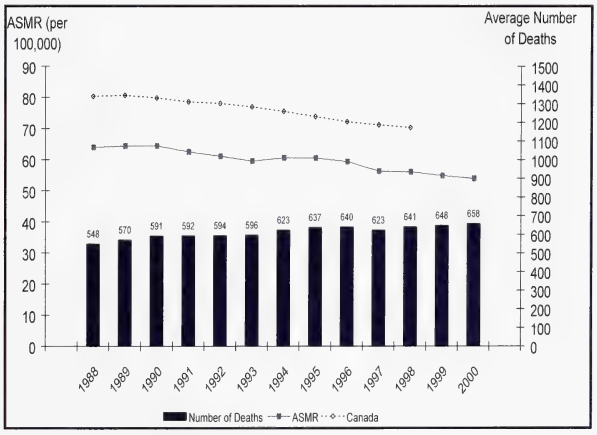
- More than four out of five lung cancers are linked to cigarette smoking and are therefore preventable.
- Trends in lung cancer incidence and mortality follow trends in smoking patterns from 20 to 30 years ago.

Figure 15: Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Lung Cancer, Alberta, (1988 - 2000)**

Females



Males

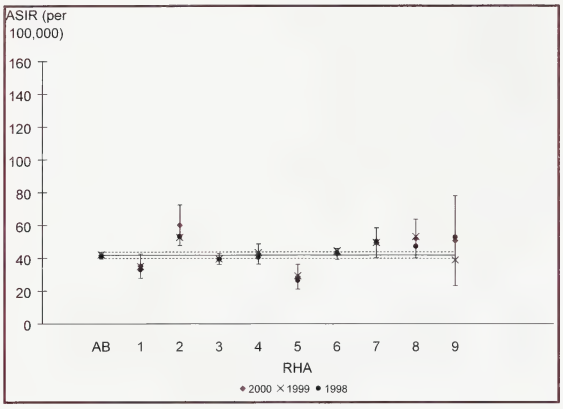


* Three-year moving averages are age-standardized to the 1991 Canadian population.

**For comparative purposes, age-standardized incidence rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1999.

Figure 16.1: Age-Standardized Incidence Rates (ASIR)* by RHA with 95% Confidence Intervals for Invasive Lung Cancer, Alberta, 2000 (average of 1999 - 2001)

Females



Males

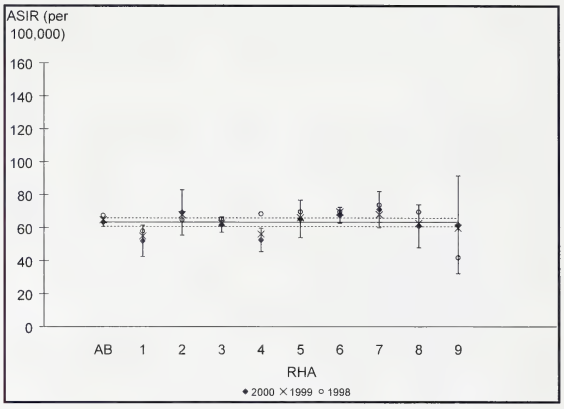
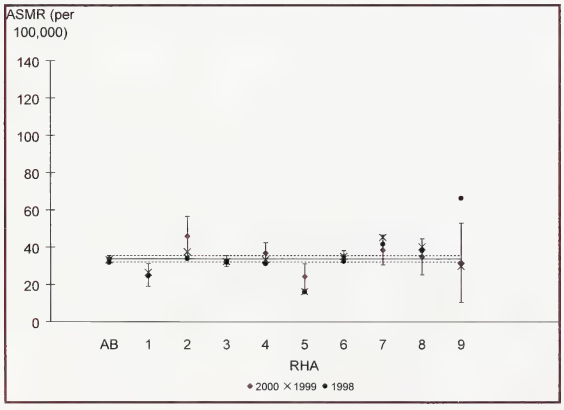
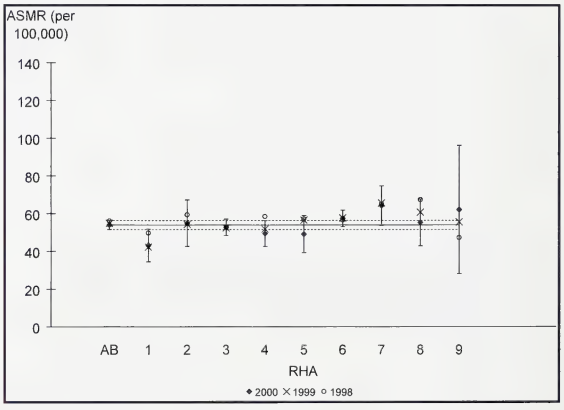


Figure 16.2: Age-Standardized Mortality Rates (ASMR)* by RHA with 95% Confidence Intervals for Invasive Lung Cancer, Alberta, 2000 (average of 1999 - 2001)

Females



Males



Lung Cancer Incidence and Mortality Rates by RHA

There is variability in lung cancer incidence rates among the RHAs, but note the larger confidence intervals which indicate the lack of precision of the rates that occurs with smaller numbers. Since lung cancer incidence is strongly related to smoking patterns, the variation of rates may be a reflection of past smoking patterns.

In general, there is a small year-to-year variation in the RHA specific rates.

The patterns of the RHA age-standardized mortality rates for lung cancer are similar to the age-standardized incidence patterns. The age-standardized mortality rates show high variability for RHAs with small populations. Fluctuations are monitored to see if they continue over a number of years and whether they are trends or random fluctuations.

* Three-year moving averages are age-standardized to the 1991 Canadian population.

Colorectal Cancer - Incidence

The age-standardized incidence rates for colorectal cancer in Alberta women show a gradual downward trend between 1981 and 1992 and now appear to be increasing. The reasons for this increase are unclear and require further investigation.

The age-standardized incidence rates for colorectal cancer in men do not show the same trends as for women. Rates for men have fluctuated between 52/100,000 in 1981 and 61/100,000 in 2000.

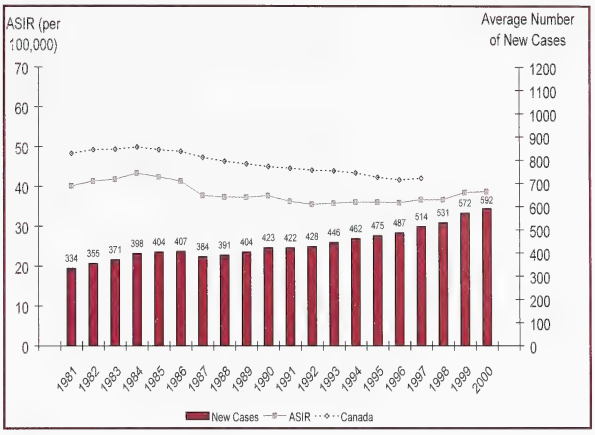
Alberta's incidence rates for colorectal cancer in both men and women are slightly lower than the Canadian rates.

Colorectal cancer is much more common in affluent countries where diets low in vegetable and fruit consumption and sedentary lifestyles have been identified as important risk factors. Consumption of vegetables and fruit is associated with a lower risk of developing several types of cancer. While vegetables appear to be important in the prevention of colorectal cancer, physical activity is also important for reducing risk.*

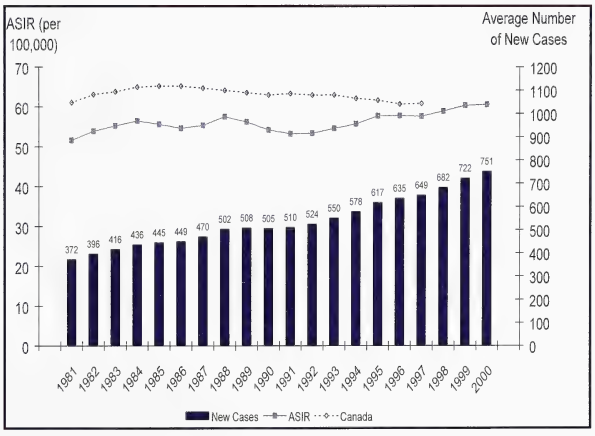
> Physical activity and a diet high in vegetables and fruit can help prevent colorectal cancer.

Figure 17: Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Colorectal Cancer, Alberta, (1981 - 2000)*****

Females



Males



* World Health Organization, World Cancer Report. Colorectal Cancer. In B. Stewart and P. Kleihues (eds.) 2003. IARC Press, Lyon, France.

**Three-year moving averages are age-standardized to the 1991 Canadian population.

***For comparative purposes, age-standardized incidence rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1998.

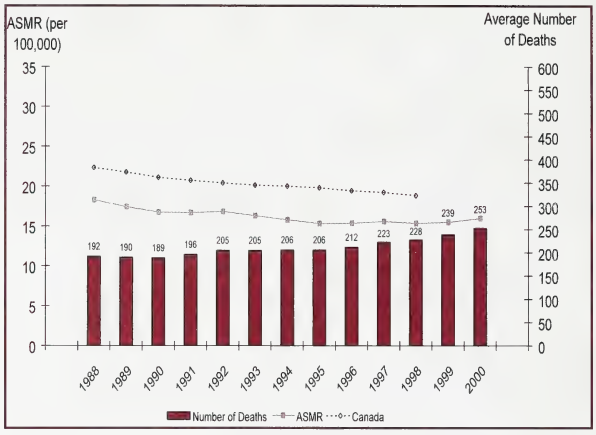
Colorectal Cancer - Mortality

Age-standardized mortality rates for men and women are gradually decreasing. This decrease is probably due to improvements in treatment. Mortality rates for men have fluctuated over time and continue to be higher than rates for women.

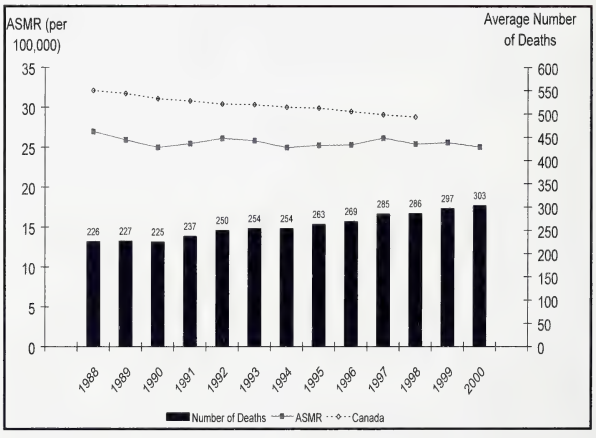
Screening and early detection can improve colorectal cancer survival rates. National recommendations for organized screening programs have recently been developed.*

Figure 18: Age-Standardized Mortality Rates (ASMR) and the Number of Deaths for Invasive Colorectal Cancer, Alberta, (1988 - 2000)*****

Females



Males



* National Committee on Colorectal Cancer Screening. Recommendations for Population-based Colorectal Cancer Screening. Available at: http://www.hc-sc.gc.ca/pphb-dgspsp/publicat/ncccs-cndcc/.

**Three-year moving averages are age-standardized to the 1991 Canadian population.

***For comparative purposes, age-standardized mortality rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1999.

Figure 19.1: Age-Standardized Incidence Rates (ASIR)* by RHA with 95% Confidence Intervals for Invasive Colorectal Cancer, Alberta, 2000 (average of 1999 - 2001)

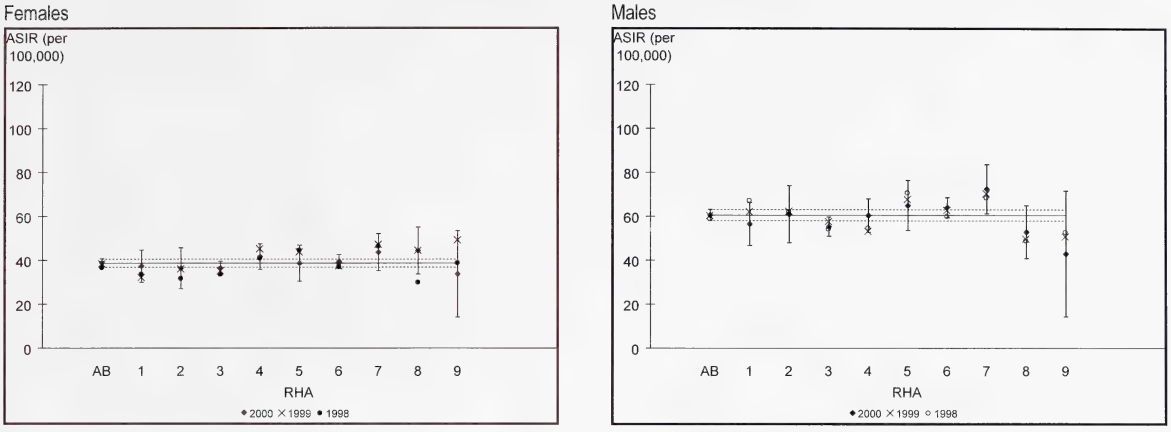
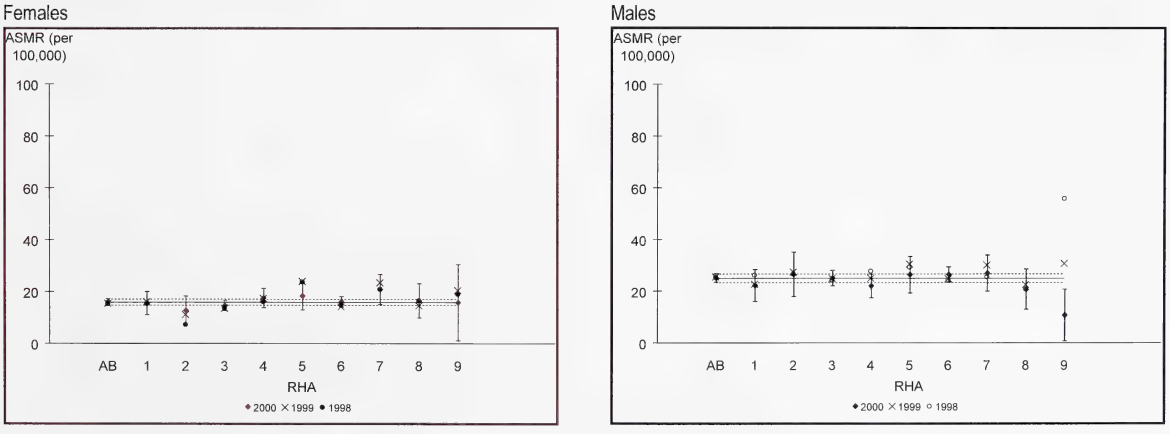


Figure 19.2: Age-Standardized Mortality Rates (ASMR)* by RHA with 95% Confidence Intervals for Invasive Colorectal Cancer, Alberta, 2000 (average of 1999 - 2001)



Colorectal Cancer Incidence and Mortality Rates by RHA

Almost all confidence intervals include the provincial average and are therefore not significantly different from the provincial average.

In general there is little yearly variation in the RHA specific rates. However, notice from the scale, the provincial average incidence rate is higher for men than for women.

RHA 9 shows rates below average but this is probably an anomaly due to erratic fluctuations in the small population numbers. In previous years, the incidence and mortality rates in RHA 9 were higher (data not shown).

* Three-year moving averages are age-standardized to the 1991 Canadian population.

Breast Cancer - Incidence and Mortality

Incidence rates for breast cancer steadily increased until the early 1990s when the rates began to stabilize in Alberta. However, since 1994 there is an indication that the rates may be increasing again. These trends may reflect an increase in screening mammography that occurred in the late 1980s and early 1990s, super-imposed on a general increase in rates.

The introduction of organized screening programs caused a surge in incidence rates by detecting some breast cancer cases earlier than they would have been diagnosed without the screening. However, even without the effect of screening mammography, there has been an underlying gradual increase in breast cancer incidence rates that began many years ago. The reason for this increase is not well understood.

Having a mother or sister diagnosed with breast cancer increases a woman's risk of developing breast cancer, but 80% of women who develop breast cancer have no family history of the disease. Obesity in post-menopausal women also increases their risk of breast cancer. It appears that physical activity is important for reducing risk.

Breast cancer mortality rates are gradually decreasing. This decrease may reflect the impact of mammography screening and improvements in treatment.

Organized mammography screening programs have been shown to be effective in reducing mortality for women aged 50-69. These programs are significantly less effective in women under age 50.

The fact that incidence rates increased while mortality rates decreased reflects better survival for diagnosed cases. The incidence and mortality rates in Alberta and Canada are very similar.

Figure 20: Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Breast Cancer, Females, Alberta, (1981 - 2000)**

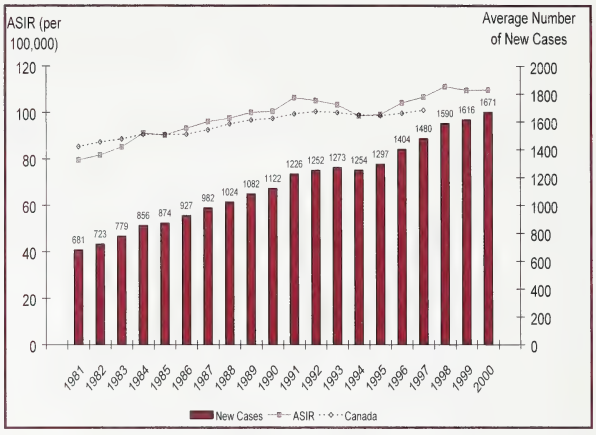
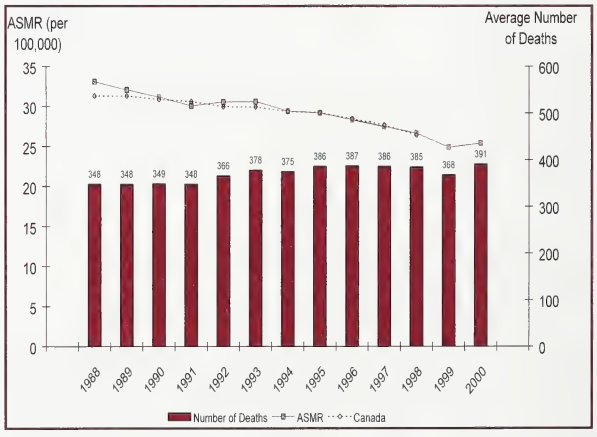


Figure 21: Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Breast Cancer, Females, Alberta, (1988 - 2000)**



* Three-year moving averages are age-standardized to the 1991 Canadian population.

**For comparative purposes, age-standardized incidence and mortality rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1998.

Breast Cancer Incidence and Mortality Rates by RHA

There is some variability in breast cancer incidence among the RHAs with smaller populations, but note the large confidence intervals.

Organized mammography screening programs have been shown to be effective in reducing mortality for women aged 50-69.

Figure 22: Age-Standardized Incidence Rates (ASIR)* by RHA with 95% Confidence Intervals for Invasive Breast Cancer, Females, Alberta, 2000 (average of 1999 - 2001)

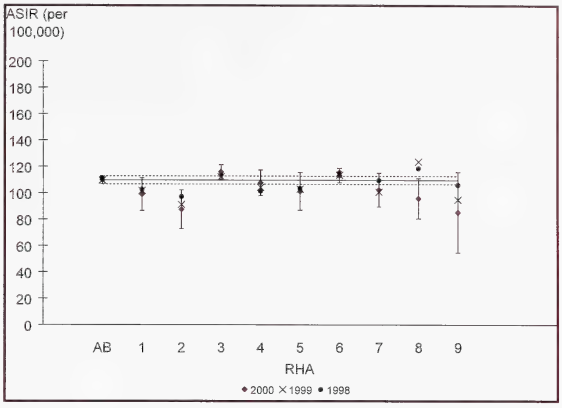
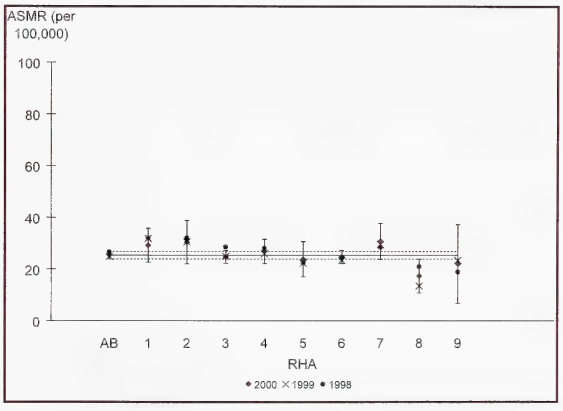


Figure 23: Age-Standardized Mortality Rates (ASMR)* by RHA with 95% Confidence Intervals for Invasive Breast Cancer, Females, Alberta, 2000 (average of 1999 - 2001)



* Three-year moving averages are age-standardized to the 1991 Canadian population.

Prostate Cancer - Incidence and Mortality

The increased incidence of prostate cancer prior to 1990 is partly due to increased detection of these cancers following the introduction of a medical procedure called trans-urethral resection of the prostate (TURP) for suspected benign prostatic hypertrophy.

The sharp increase since 1990 is predominantly the result of increased detection using prostate specific antigen (PSA) testing that became available in Alberta in 1989. The testing resulted in early detection of clinically unsuspected cancers, some of which may have been found later and others that may never have been diagnosed because of the high prevalence of latent prostate cancer.

Autopsy studies have found that between 60% and 70% of men over age 80 have evidence of prostate cancer although they had no clinical symptoms.* These data, along with some negative impacts caused by prostate cancer diagnosis and treatment and the unproven efficacy of PSA testing as a screening tool, have caused some of the controversy around screening for prostate cancer. The goal of a screening program is to reduce mortality from the disease being screened, and to date, there is no evidence from randomized controlled trials that screening reduces mortality from prostate cancer.**

The pattern of high incidence rates is seen throughout Canada. Despite the sharp increase in prostate cancer incidence from 1990 to 1993 and the more recent increase since 1996, there has not been an associated increase in mortality rates. Age-standardized mortality rates have been relatively stable since 1990 although there is the beginning of a downward trend in more recent years. Although mortality rates are beginning to decrease, it is unclear whether this is attributable to PSA testing.

Figure 24: Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Prostate Cancer, Males, Alberta, (1981 - 2000)****

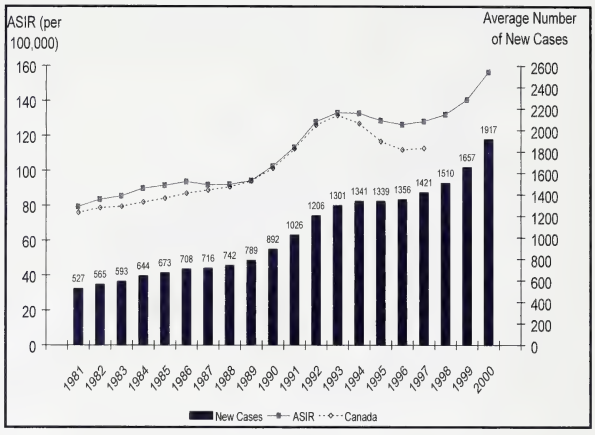
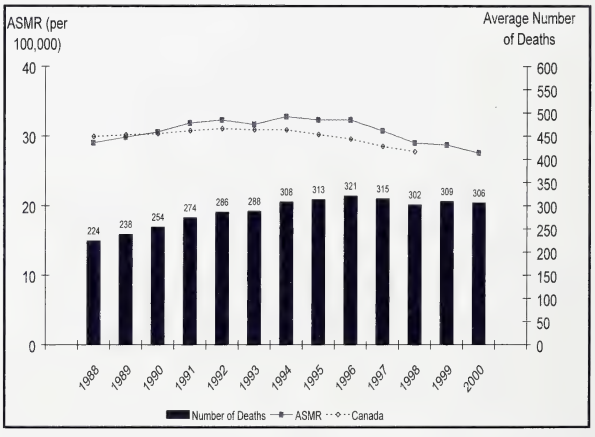


Figure 25: Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Prostate Cancer, Males, Alberta, (1988 - 2000)****



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* Lenhard, R.E., Osteen, R.T., Gansler, T.S. *Clinical Oncology*. American Cancer Society, Blackwell Science Inc.; 2001.

**Readers looking for a review of prostate cancer screening issues are referred to the following sources.
National Cancer Institute. *Prostate, lung, colorectal and ovarian (PLCO) cancer screening trial*. Bethesda, Md: National Cancer Institute; 2003. Available at http://www3.cancer.gov/prevention/pico/.
Barry, J.M., *Prostate-Specific-Antigen Testing for Early Diagnosis of Prostate Cancer*, New England Journal of Medicine. May 2001, 344 (18) 1373.

***Three-year moving averages are age-standardized to the 1991 Canadian population.

****For comparative purposes, age-standardized incidence and mortality rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1998.

Prostate Cancer Incidence and Mortality Rates by RHA

The incidence rates show considerable fluctuations year-to-year within regions, but the 2000 incidence rates are generally higher in the southern RHAs and lower in the northern RHAs. This geographic difference in rates may reflect different patterns of PSA testing in the province, but other explanations are also possible. Trends will continue to be monitored by the Alberta Cancer Board.

There is less variation across RHAs and by year in mortality rates compared to the variability in incidence rates. None of the rates are statistically significantly different from the provincial average. This observation adds strength to the suggestion that the higher incidence in some areas may be due to differences in detection patterns.

Two randomized controlled trials are underway to better understand the impact of screening on prostate cancer. Currently, the benefits of PSA testing remain unproven as a population-based screening tool.

Figure 26: Age-Standardized Incidence Rates (ASIR)* by RHA with 95% Confidence Intervals for Invasive Prostate Cancer, Males, Alberta, 2000 (average of 1999 - 2001)

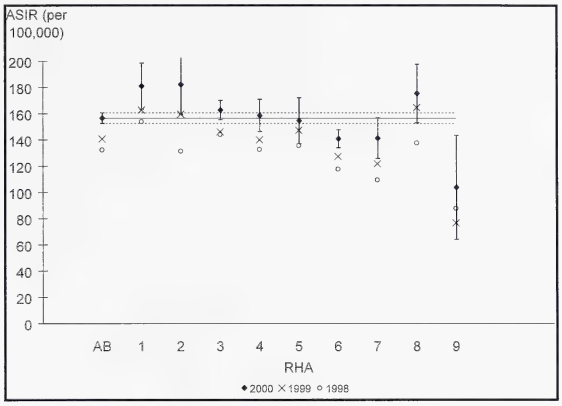
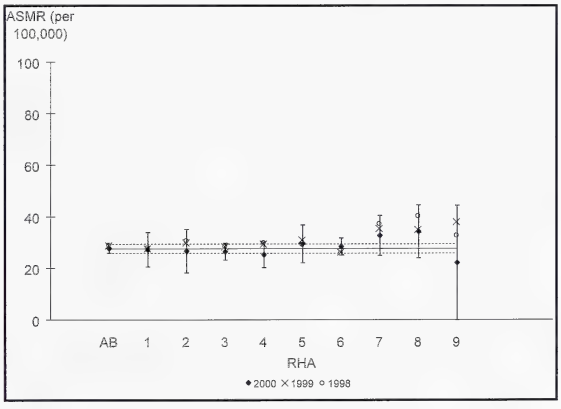


Figure 27: Age-Standardized Mortality Rates (ASMR)* by RHA with 95% Confidence Intervals for Invasive Prostate Cancer, Males, Alberta, 2000 (average of 1999 - 2001)



* Three-year moving averages are age-standardized to the 1991 Canadian population.

Cervical Cancer - Incidence and Mortality Rates and Incidence Rates by RHA

Figure 28 indicates that there is a substantial variation between age-standardized incidence rates in Alberta and Canadian rates. This variability is probably due to the smaller numbers seen at the provincial level. There appears to be a general downward trend in national incidence rates that is most likely due to Pap smear screening. Pap smear screening can prevent the incidence of invasive cervical cancer by detecting pre-cancers when they can be effectively treated before developing into cancer.

Further reduction in incidence rates is expected as a result of the implementation of the Alberta Cervical Cancer Screening Program, coordinated by the Alberta Cancer Board. The program will focus on increasing participation by underscreened women, improving screening services and ensuring women with abnormal screening tests receive appropriate follow-up and treatment.

Cervical cancer has a very good prognosis when detected and treated early; therefore, the mortality rates are considerably lower than the incidence rates. Nonetheless, almost 40 Alberta women died in 2000 from cervical cancer and many of those deaths could have been prevented.

Almost all cases of cervical cancer are linked to infection with Human Papilloma Virus (HPV). Infection with other sexually transmitted diseases can also increase the risk. Also, women who smoke are at higher risk for developing cervical cancer.

There is some variation in rates and wide confidence intervals are displayed for 2000, especially for those RHAs with small populations. The regional mortality rates are not presented for cervical cancer because the small number of deaths makes the regional fluctuations difficult to interpret.

Figure 28: Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Cervical Cancer, Females, Alberta, (1981 - 2000)**

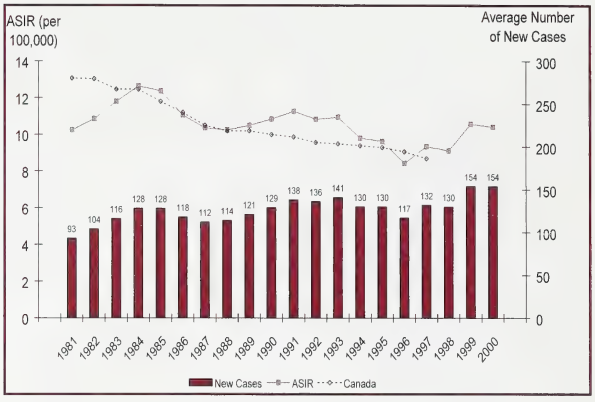


Figure 29: Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Cervical Cancer, Females, Alberta, (1988 - 2000)**

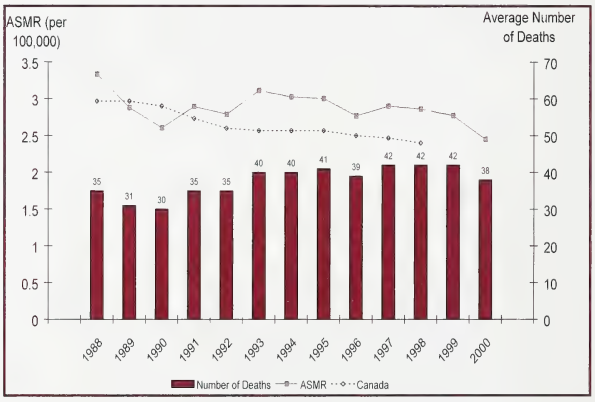
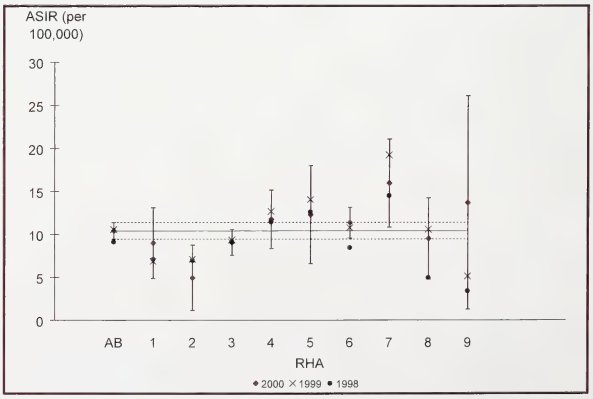


Figure 30: Age-Standardized Incidence Rates (ASIR)* by RHA with 95% Confidence Intervals for Invasive Cervical Cancer, Females, Alberta, 2000 (average of 1999 - 2001)



* Three-year moving averages are age-standardized to the 1991 Canadian population.

**For comparative purposes, age-standardized incidence and mortality rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1998.

Melanoma Skin Cancer - Incidence

Melanoma skin cancer showed a sharp increase from 1992 to 1995 but rates have since leveled off. The increase in incidence of this cancer could be largely due to a change in cancer registration coding procedures. In 1993, the Alberta Cancer Registry adopted the NAACCR* coding rules as developed by the SEER** program—this method of coding captured more cancers. The cancer rates stabilized after 1995 as the effect of the 1993 coding changes leveled off.

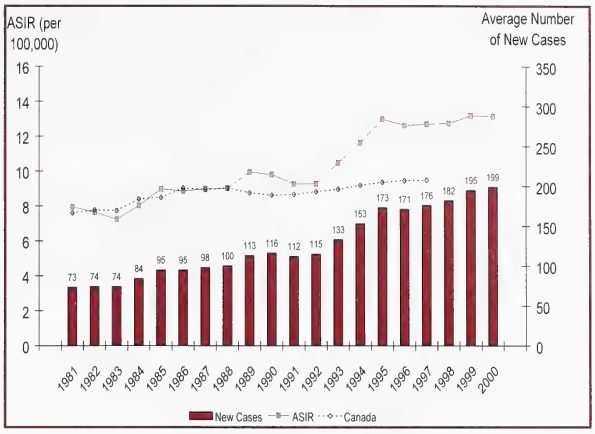
There was a similar increase in melanoma incidence for men and women in the early 1990s. In recent years, rates among women have leveled off while rates among men are still increasing. This increase is being monitored to see if the rates will continue to increase or level off.

Note that mortality data are not included for melanoma skin cancer. Even though it is by far the most serious form of skin cancer, the survival rate is very high when detected and treated early.

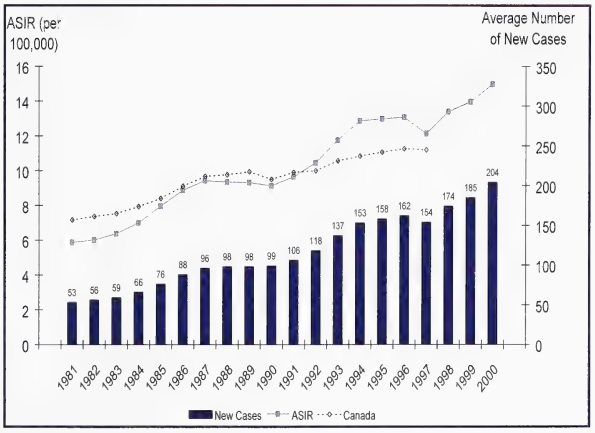
Reducing exposure to ultraviolet radiation, especially among children, is the most effective measure associated with reducing both melanoma and non-melanoma skin cancer. Fair-skinned people and those who spend time outdoors, either occupationally or recreationally, are at increased risk of developing skin cancer. Safe sun practices, such as wearing protective clothing, applying sunscreen and seeking shade are the most effective ways to protect against skin cancer.

Figure 31: Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Melanoma Skin Cancer, Alberta, (1981 - 2000)****

Females



Males



Fair-skinned people and those who spend time outdoors, either occupationally or recreationally, are at increased risk of developing skin cancer.

* NAACCR - North American Association of Central Cancer Registries

** SEER - Surveillance, Epidemiology & End Results Program

*** Three-year moving averages are age-standardized to the 1991 Canadian population.

****For comparative purposes, age-standardized incidence rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1998.

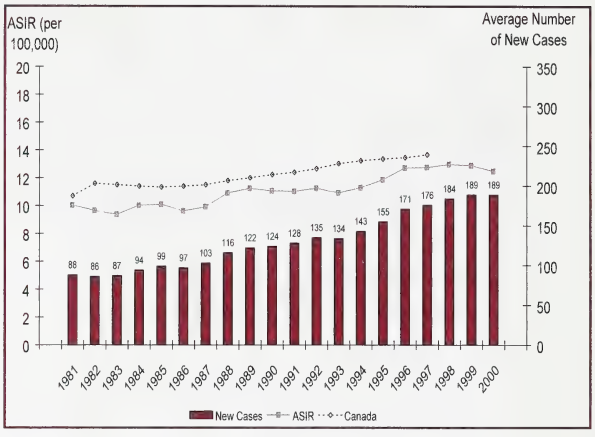
Non-Hodgkin's Lymphoma - Incidence

Non-Hodgkin's lymphoma age-standardized incidence rates have been increasing in women and men. This increase is similar to the pattern seen in Canada as a whole. Little of the increase in non-Hodgkin's lymphoma can be explained by known viral or environmental risk factors,* although drugs, carcinogens or infectious agents, such as HIV, may create immunosuppressive conditions associated with increased incidence of non-Hodgkin's lymphoma. The increase in incidence may also be affected by an improved ability to detect and classify this disease.

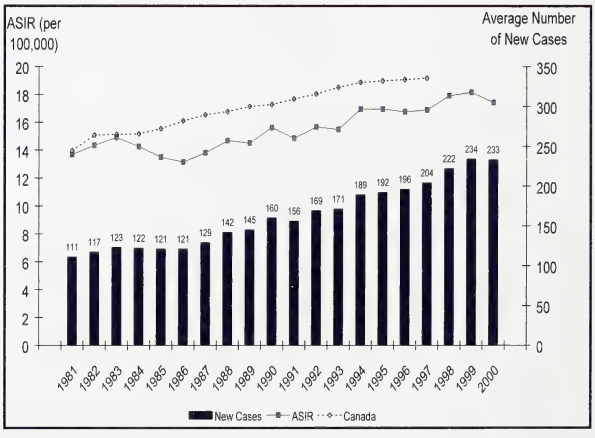
Men had a slightly higher rate of 17 cases per 100,000 in 2000 compared to 13 per 100,000 in women for the same year.

Figure 32: Age-Standardized Incidence Rates (ASIR) and New Cases for Non-Hodgkin's Lymphoma, Alberta, (1981 - 2000)*****

Females



Males



Camelos, George P., Andrew Lister and Jeffrey Sklar. *The Lymphomas* (Philadelphia: W.B. Saunders Company, 1998) 58.

*Three-year moving averages are age-standardized to the 1991 Canadian population.

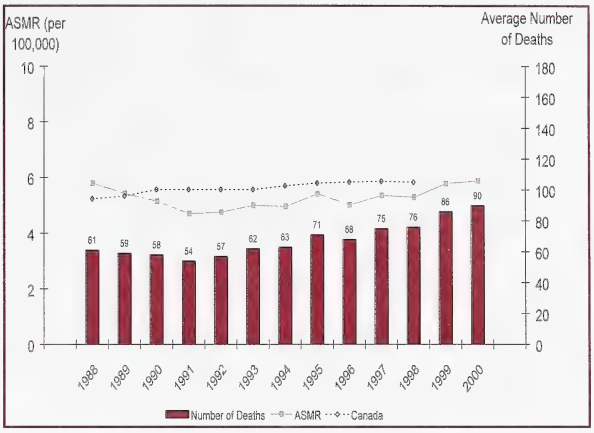
***For comparative purposes, age-standardized incidence rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1998.

Non-Hodgkin's Lymphoma - Mortality

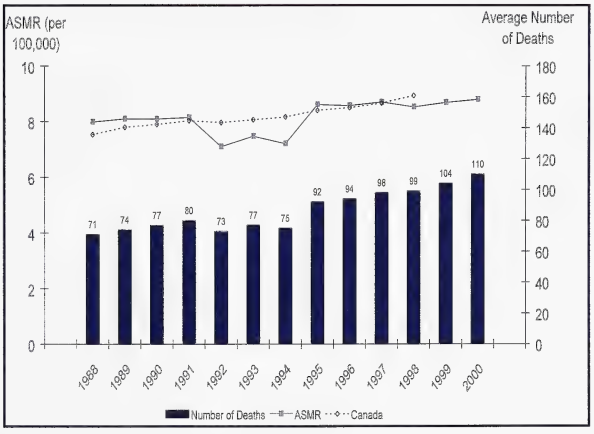
Similar to age-standardized incidence rates, mortality rates are slightly higher for men than for women. In 2000, men had a mortality rate of 9 cases per 100,000 compared to 6 per 100,000 in women.

Figure 33: Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Non-Hodgkin's Lymphoma, Alberta, (1988 - 2000)**

Females



Males



* Three-year moving averages are age-standardized to the 1991 Canadian population.

**For comparative purposes, age-standardized incidence and mortality rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1999.

Pediatric Cancer - Incidence

Cancer is much less common in children (less than 15 years of age) than in adults. The types of cancer seen in children also differ from the common cancers in adults. The most common cancers in Alberta children are leukemia, lymphoma, brain and spinal.

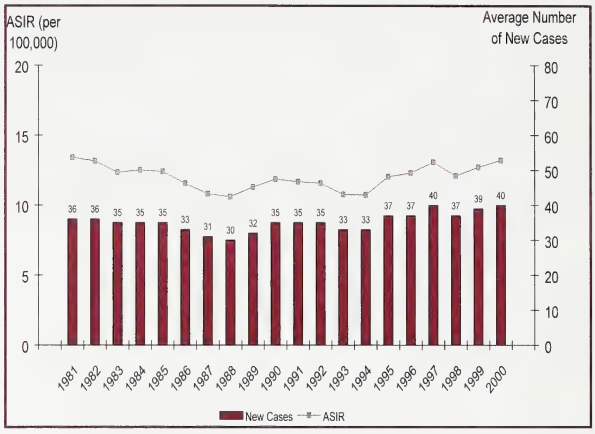
The causes of cancer in children and adults are different. In adults, many cancers are due to a long pattern of lifestyle factors such as exercise, diet and tobacco consumption, which have not had an opportunity to play a role in pediatric cancer. Genetic factors play a larger role in pediatric cancer.

Pediatric invasive cancer occurs slightly more frequently among boys (15 per 100,000) than girls (13 per 100,000).*

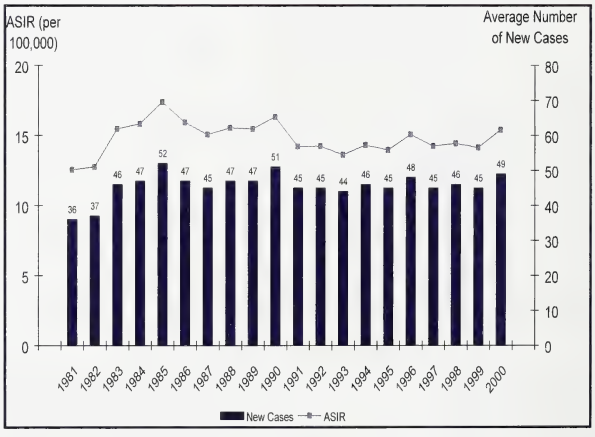
The incidence rates of pediatric cancer have remained relatively stable since the 1980s; however, there is better news on mortality rates as shown on page 33.

Figure 34: Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Pediatric Cancer (less than 15 years of age), Alberta, (1981 - 2000)*

Females



Males



Three-year moving averages are age-standardized to the 1991 Canadian pediatric population.

Pediatric Cancer - Mortality

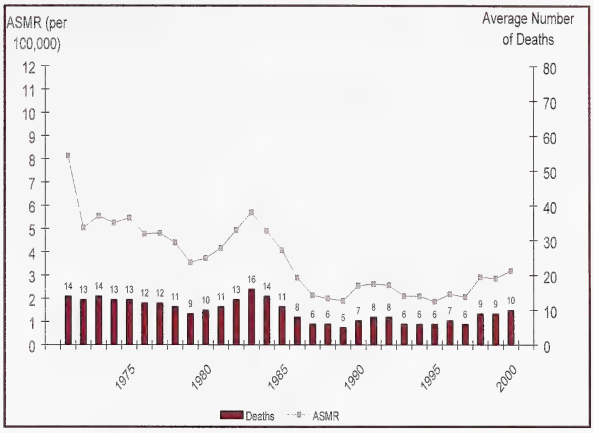
Many cancers in children are successfully treated. In 2000, 2 per 100,000 boys and 3 per 100,000 girls died from pediatric invasive cancer.*

Over the past 29 years, there has been a marked improvement in survival for children with cancer due to advances in treatment resulting from cancer research.

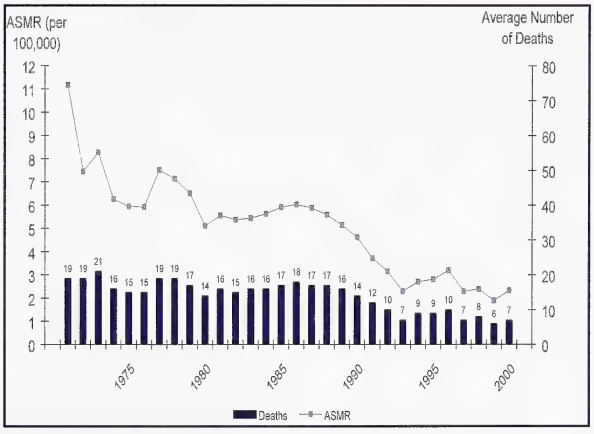
> Advances in treatment have reduced childhood cancer mortality rates by more than 50% since the 1950s.

Figure 35: Age-Standardized Mortality Rates (ASMR) and the Number of Deaths for Invasive Pediatric Cancer (less than 15 years of age), Alberta, (1971 - 2000)

Females



Males



* Three-year moving averages are age-standardized to the 1991 Canadian pediatric population.

Pancreatic Cancer - Mortality

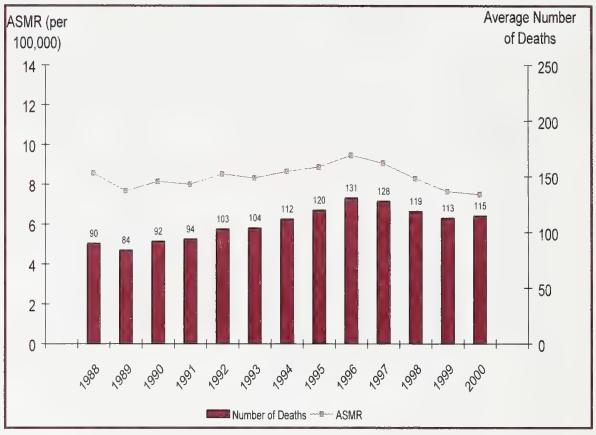
Incidence data are not included for cancer of the pancreas because mortality rates are so similar to incidence. Mortality for cancer of the pancreas gradually increased in women up to 1996 and subsequently appears to be decreasing. In men it has decreased over the whole period. Although this cancer accounts for only two percent of incident cancers, in 2000 it was the sixth leading cause of cancer deaths in Alberta due to its low survival rate. There is little variation in mortality rates for pancreatic cancer among the RHAs (data not shown).

The only well-established risk factor of significance is smoking.* Although the cause of most cases of pancreatic cancer is unknown, diet may also be a factor, and hereditary risk is evident in up to 10% of cases. Pancreatic cancer occurs more often in people who have diabetes than in people who do not. Exposure to such industries as mining, pulp and paper, and petrochemical may also be associated with an increased incidence of pancreatic cancer.

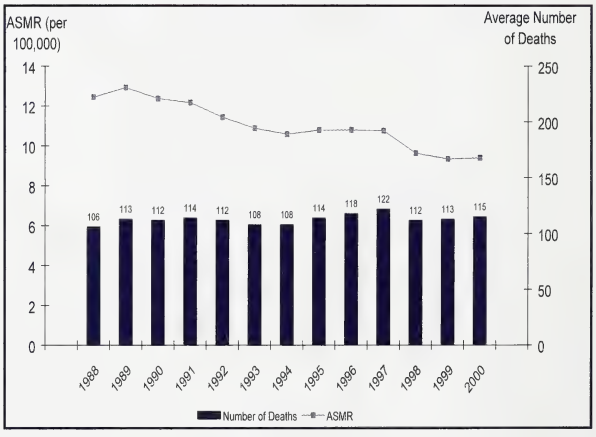
There are no effective screening or diagnostic tests available for this disease.

Figure 36: Age-Standardized Mortality Rates (ASMR) and the Number of Deaths for Invasive Pancreatic Cancer, Alberta, (1988 - 2000)**

Females



Males



* Stephens, F.O., *The Increased Incidence of Cancer of the Pancreas*, Australian New Zealand Journal of Surgery. May 1999, 69 (5) 331

** Three-year moving averages are age-standardized to the 1991 Canadian population.

Three-Year Averages

The statistics in this report, including the number of cases, number of deaths, ASIR (age-standardized incidence rates) and ASMR (age-standardized mortality rates), are presented as three-year averages. Averages are used to smooth out year-to-year fluctuations so that the underlying trend may be more easily observed. This smoothing of trends is especially important when the number of cancer cases per year is relatively small. Three-year averages also more accurately reflect the situation in RHAs, especially the smaller ones where year-to-year variability can be quite large.

To calculate a three-year average for the number of events, the annual numbers are summed for three years and divided by three. For example, in the graph on page 37, the number of cases for all invasive cancers in Alberta men in 2000 is calculated by adding the total number of invasive cancers that occurred in 1999-2001 inclusive, then dividing by three. As shown in the graph on page 37, there were an average of 5,918 cases of invasive cancers in Alberta men in 2000.

The three-year averages for age-specific rates are calculated using the number of events occurring in three years and dividing by the total population in the age range for the three years of interest. ASIRs and ASMRs are then calculated from the age-specific rates.

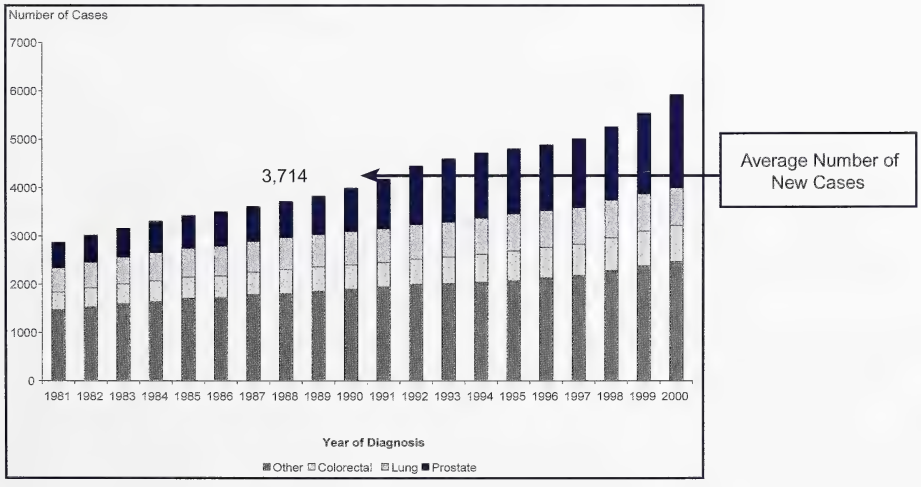
Average Number of New Cases and Deaths

In the body of this report, the average number of new cases/deaths are presented as three-year averages. For example, in the graph below, the average number of new cases for all invasive cancers in males in 1988 is 3,714 cases, an average of the number of cases in 1987, 1988 and 1989.

The number of deaths is also presented as a three-year average and calculated in the same manner as new cases. Age-specific incidence and mortality rates are also presented as three-year averages.

The projections and the detailed figures in the Regional Health Authority inserts are **not** three-year averages.

Figure 37: Total Number of New Cases of Invasive Cancer*, Males, Alberta (average of 1981 - 2000)



*Excluding non-melanoma skin cancer

Age-Specific Incidence and Mortality Rates

Age-specific incidence rates are used to compare the incidence of cancer among age groups. Age-specific incidence rates indicate the number of new cases that occur during a year in a specific age group, expressed as a rate per 100,000 persons in that age group. The age groups used were 0-14, 15-44, 45-54, 55-64, 65-74, 75-84 and 85+.

The lines on Figure 38 (below) indicate the age-specific rates for prostate, lung and colorectal cancers in Alberta for 2000. For example, the age-specific rate for prostate cancer in 75- to 84-year-old Alberta males in 2000 was 1,051 cases per 100,000.

Usually the incidence of cancer varies sharply across age groups. Note that the incidence rate for these invasive cancers is much higher in men in the 65-74, 75-84 and 85+ age groups compared with the younger age groups. In this report, age-specific graphs are only presented for lung, colorectal, prostate and breast cancers. For more information on age-specific rates for individual sites, please see the Alberta Cancer Registry Annual Report of Cancer Statistics.

Age-Specific Mortality Rates are expressed in the same manner.

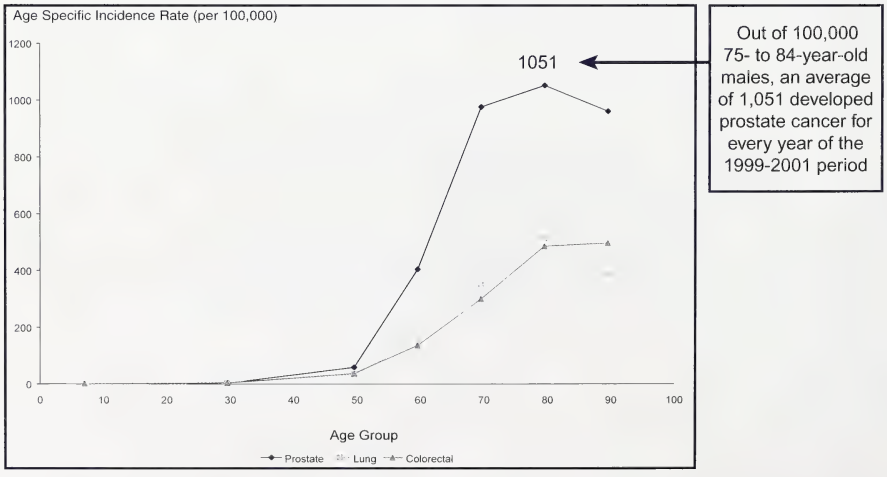
Age-Standardized Incidence and Mortality Rates Over Time

Age-standardized incidence and mortality rates (ASIR and ASMR) are used to compare cancer rates among populations where the population structures are different and to identify trends over time where the population structure changes over time. The age-standardized rate is a weighted average of the age-specific rates, using a standard population distribution. The standardized rates reflect the overall incidence rate (or mortality rate) that would be expected if the population of interest had an age structure identical to the standard population.

To calculate ASIRs (or ASMRs), the actual rates (age-specific rates) of cancer in the Alberta population are applied to a standard population (the 1991 Canadian population). For example, the rate of cancer in each age group for 1981 in Alberta is applied to the 1991 Canadian population to determine the 1981 ASIR (or ASMR).

Alberta's population is aging and cancer incidence rates rise with age; therefore, the number of cases of cancer is increasing. It is important to note that the increased number of cases does not mean that the

Figure 38: Age-Specific Incidence Rates for Prostate, Lung and Colorectal Cancers, Males, Alberta, 2000 (average of 1999 - 2001)



rate of cancer is increasing. Comparing the number of cases of cancer in the younger and smaller 1981 population to the older and larger 2000 population gives an indication of the increased burden on the health care system, but does not indicate trends in the underlying disease rates.

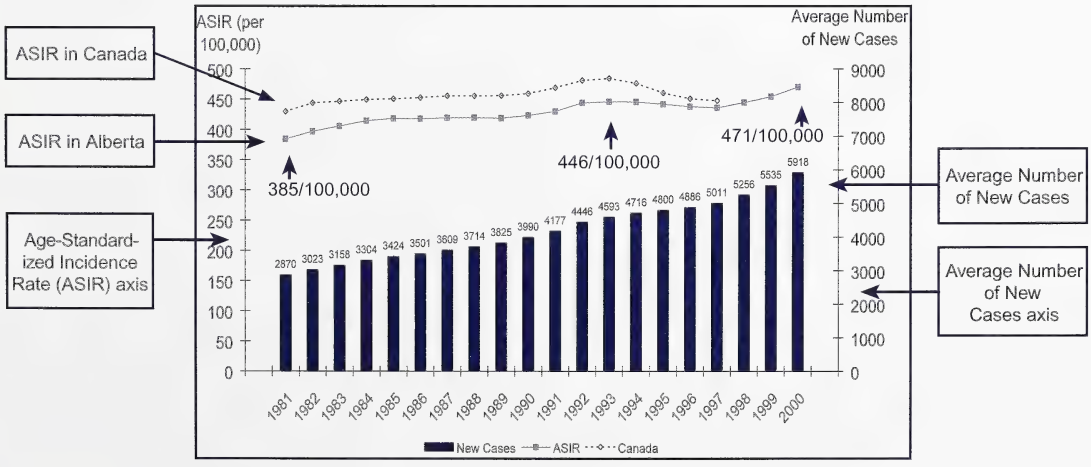
Note in Figure 39 (below) that the number of new cases for all invasive cancers in males increased from 2,870 in 1981 to 5,918 in 2000 as indicated on the blue bars. This increase is substantial and has a major impact on the resources needed to care for patients with cancer. Using ASIRs (the incidence rate for all invasive cancers in males standardized to the 1991 Canadian population) we see an increase from 385/100,000 in 1981, that rose to 446/100,000 in 1993, decreased slightly and then increased to 471/100,000 in 2000.

A new feature on the age-standardized incidence and mortality graphs is the inclusion of Canadian rates. These rates, derived from Canadian Cancer Statistics 2003*, are calculated in a similar fashion to the Alberta rates (i.e., using the 1991 Canadian standard population and three-year moving average). Please refer to the Technical Report section at the back of this report (page 40) for more detailed information.

The Canadian ASIRs are included so that differences and similarities between provincial and national rates can be compared. Also, the most recent actual Canadian incidence rates available are from 1998 resulting in a most recent three-year moving average of 1997 (1996, 1997 and 1998 averaged).**

The 1991 Canadian population is used as the standard population in the calculation of age-standardized rates in this document. It is also generally used as the standard population for Canadian and other provincial reports, except for those produced by Alberta Health and Wellness, which use the 1996 Canadian population. The choice of 1991 or 1996 Canadian population as the standard has very little effect on the cancer rates presented.

Figure 39: Age-Standardized Incidence Rates (ASIR) and New Cases for All Invasive Cancers, Males, Alberta, (1981 - 2000)*****



* National Cancer Institute of Canada. *Canadian Cancer Statistics 2003*, Toronto, Canada, 2003.

**Three-year moving averages are age-standardized to the 1991 Canadian population.

***For comparative purposes, age-standardized incidence rates for the whole of Canada are included. While the most current Alberta data extends to 2001, the most recent Canadian data only extends to 1998.

Age-Standardized Incidence and Mortality Rates by RHA

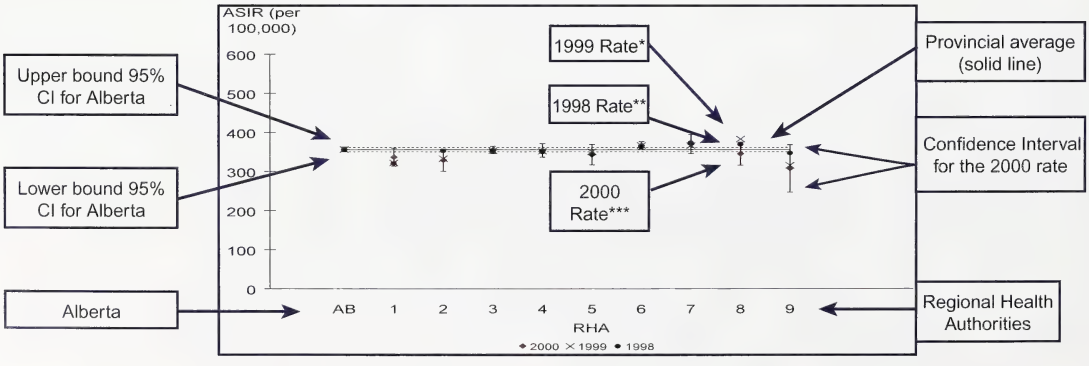
Age-standardized rates by RHA are presented for the last three years. In the figure below, the solid diamond (◆) represents the 2000 rate, the ✕ symbol represents the 1999 rate and the solid circle (●) represents the 1998 rate. As previously mentioned, each of these rates is based on a three-year average. The provincial average is represented by the solid line with the dotted lines on either side showing the confidence interval. If the regional I bar passes through the centre line, the difference between the data points is not statistically significant. The bars extending from the solid diamond indicate the confidence interval for the most current year's rate (2000 rate in the example below). A confidence interval (CI) indicates the precision of an estimate. Confidence intervals are partly a function of the population size; as the population size increases, CIs narrow. Wide CIs indicate less precision and occur when the population size is smaller.

Note for example, the wider CI in Region 9 in Figure 40. This RHA has a relatively small population. Rates from small populations are more prone to variation due to chance than large populations, and therefore produce wider confidence intervals. Consequently, the Alberta CI is narrower than those of the regions. The age-standardized rate for Alberta is dominated by the rates for RHA 3 (Calgary) and RHA 6 (Capital), which together represent almost two-thirds of the population of Alberta.

In order to evaluate the age-standardized rate of an RHA, note should be taken of the variability of the rates among the RHAs, as well as the width of the confidence interval. Age-standardized rates should be monitored over time.

Age-standardized mortality rates for individual RHAs reflect the number of residents of an RHA who die of cancer, regardless of where they die. This method is used so that the mortality rates presented in the tables accurately reflect a health indicator of individuals living in the RHA. Details regarding where deaths are occurring are still available in the RHA specific data.

Figure 40: Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals for All Invasive Cancers Females, Alberta, 2000 (average of 1999 - 2001)

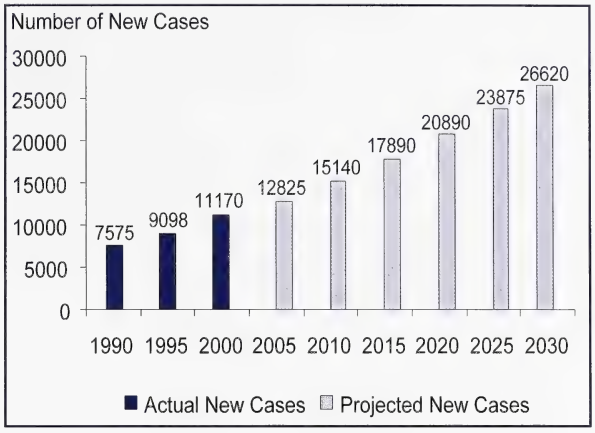


* 1999 Rate is an average of 1998-2000
**1998 Rate is an average of 1997-1999
***2000 Rate is an average of 1999-2001

Projections

The projected number of new invasive cancers is presented slightly differently from the average number of new cases. The projection figures present actual and projected numbers rather than three-year moving averages. For example, in Figure 41, the projected number of new cancers in Alberta in 2010 is 15,140.

Figure 41: Actual and Projected Number of New Cases of Invasive Cancer, Alberta, 1990-2020

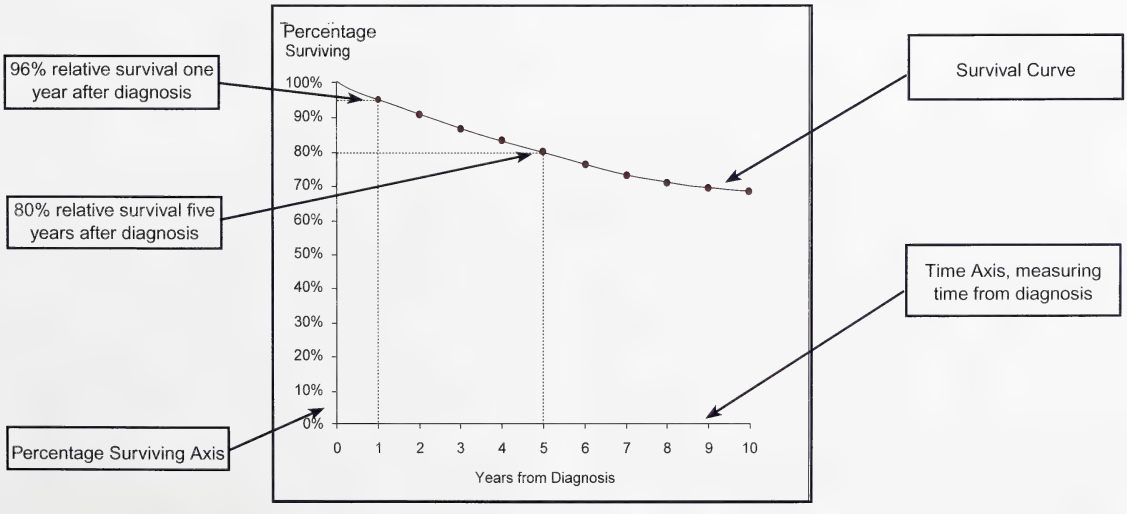


Survival Curves

Survival time for cancer patients is defined as the length of time between diagnosis and death. The method of relative survival is used in this publication. Relative survival is defined as survival of cancer patients relative to that of the general population, or the ratio of observed (all cause) survival in a group of cancer patients relative to the expected survival of a similar group of people in the general public, matched by age and gender in Alberta. For example, if relative survival for breast cancer is 96% at 1 year, the survival of breast cancer cases is 4% lower than the general population. Likewise, if relative survival for breast cancer is 80% at 5 years, the relative survival for breast cancer cases is 20% lower than the general population. For further details on relative survival, please refer to page 43 in the Technical Report section.

Survival curves can be used to compare survival outcomes between different groups (for instance, sex, cancer site, and year of diagnosis). The higher the survival curve, the better the survival rates for that particular cancer. Survival curves are presented on page 17, and depict all cancer survival as well as breast, prostate, lung, and colorectal cancer survival.

Figure 42: Relative Survival Curve for Invasive Breast Cancer, Females, Alberta



Data Preparation

The data for this report come from the Alberta Cancer Registry. The Alberta Cancer Registry, of the Alberta Cancer Board's Division of Population Health and Information, records and maintains data on all new primary cancers and cancer deaths occurring in the province, as mandated by the Cancer Programs Act of Alberta. The Cancer Registry captures all invasive and in situ cancers diagnosed amongst Albertans as well as borderline conditions and central nervous system tumours that have been seen at an Alberta Cancer Board facility.

Registration of Alberta residents diagnosed with cancer has been documented since 1942. However, due to consistent coding, data entry and data retrieval techniques, data starting from the 1970s are considered reliable. At that time, the Cancer Registry became patient based, rather than tumour based.

The Alberta Cancer Registry operates out of two centres. The Tom Baker Cancer Centre in Calgary is responsible for the southern half of the province, while the Cross Cancer Institute in Edmonton maintains data collection for the northern half of the province.

It should be noted that comparative figures may change between different years of the Regional Picture report. The Alberta Cancer Registry is continually updating the registry database that the report is based on as new information becomes available. The data in this report are based on the registry data as of October 6, 2003.

Sources of Data

Population

For the period from 1995 to 2001, Alberta Health and Wellness has supplied the population data for Alberta and its Regional Health Authorities. These population estimates are based on the Alberta Health and Wellness Stakeholder Registry and have been adjusted to account for the April 2003 boundary changes. Prior to 1995, Statistics Canada supplied population figures for the province. The agreement between Statistics Canada and Alberta Health and Wellness population estimates is high. For example, in 1996 there is less than a two-percent discrepancy between the overall population figures.

The standard population used in the age-standardized rates is the 1991 Canada Standard Population. This standard is the Canadian population distribution based on the final post-censal estimates of the 1991 census, adjusted for under-coverage.

Residence

All data in this report relate only to those people who were resident in Alberta at the time of diagnosis or death. The RHA of residence is determined primarily from the postal code. Alberta Health and Wellness has supplied a postal code to RHA conversion file for the most recent RHA boundaries (April 2003). The Alberta Cancer Registry has also developed a conversion file of community name to RHA.

For incidence, the Standard Geographic Code or the Postal Code determine residence. Standard Geographic Code is available for 99.7% of cases and postal code for 98.3% of all cases registered (resident and non-resident).

For mortality, residence is determined from the death certificate. RHA of residence at the time of death is defined from postal code and/or town of residence as recorded on the death certificate. Note that this refers to the RHA of residence at the time of death, not the RHA where the death occurred. There is additional information in the Regional Inserts that addresses where deaths occurred. Approximately 80% of death certificates have a postal code and only one or two cases per year are missing town. Where both postal code and town are recorded on the death certificate there is less than 0.5% disagreement on RHA designation. Agreement between postal code and town (where both are recorded) as to resident/non-resident of Alberta is almost 100%.

Incidence

Provincial incidence trends are calculated using data from 1980 to 2001. Since three-year averages are used, the graphs show trends from 1981 to 2000. The Alberta Cancer Registry learns of new cancers from a variety of sources. Laboratories throughout the province send a copy of each pathology report with a diagnosis of cancer to the nearest Alberta Cancer Board facility. The reports are then available to the Registry. Other items that also may be

received are operative reports, discharge summaries, x-ray reports or scans, and autopsy reports.

All incidence tables and graphs represent new cancers and not the number of Albertans with cancer, as a person may have more than one type of cancer.

Throughout the report there are references to "All Invasive Cancers". This excludes non-melanoma skin cancers unless explicitly stated otherwise. Although the number of non-melanoma skin cancers in the province is quite large, this cancer is easily treated and seldom fatal. For these reasons, and concerns regarding the completeness of Cancer Registry records for non-melanoma skin cancers, it is routinely excluded from "All Cancers".

Mortality

Provincial mortality trends are calculated using data from 1987 to 2001. Since three-year averages are used, the graphs show trends from 1988 to 2000. Mortality data prior to 1987 are not presented because of missing data.

Alberta Vital Statistics sends the Cancer Registry an electronic file with a list of every death occurring in Alberta. These data are linked to the Registry to identify cancer patients who have died. Information on the date, cause and place of death are captured. Autopsy data, if different from the original diagnosis, are also entered. Cancer Registry staff may modify the death cause listed on the death certificate based on information available in the patient's medical record (see: 'Coding' section). Less than one percent of new cancer cases are registered through the death certificate only.

Coding

Methods for coding cancers have evolved over the years and continue to be refined. Cancers are currently coded according to the International Classification of Diseases for Oncology, third edition (ICDO-3) which classifies all tumours by site and morphology. This is a recent change in coding practice at the Alberta Cancer Registry. Coding for cases diagnosed prior to 2001 were coded using ICDO-2. The sites used in this report are based on groupings of ICDO-3 or ICDO-2 codes, depending on the year of coding. The primary site of incident cancers is the tissue or organ in which the cancer originates. In general, data are tabulated by a three-digit topography code with some exceptions. For certain morphologies such as lymphomas, classification by morphology takes precedence over topography.

It is possible for one individual to be diagnosed with more than one incident primary tumour, either at the same time or subsequently. The Alberta Cancer Registry follows the SEER rules for coding multiple primaries, which in general records separate primaries if the histology (sub) site or laterality is different from a previous cancer, or a new cancer is diagnosed more than two months after the initial diagnosis that is not stated to be recurrent or metatastic. SEER (Surveillance, Epidemiology and End Results Program) is a program of the U.S. National Cancer Institute that collects and publishes cancer incidence and survival data from population-based cancer registries. NAACCR (North American Association of Central Cancer Registries), in which the Alberta Cancer Registry is an active member, supports the use of SEER coding rules for multiple primaries.

Microscopic examination of tissues or cells is the definitive diagnostic test for cancer. During the period 1994-1999, 93% of all cancers registered in the Alberta Cancer Registry were microscopically verified. In particular, 98% of breast cases, 93% of prostate cases, 87% of lung cases and 96% of colorectal cancer cases were microscopically confirmed.

The completeness of case ascertainment may be estimated by an index derived from the ratio of the age-standardized incidence to mortality rates. For 1995-1999, relative to the combined SEER registries, the relative completeness of the Alberta Cancer Registry was estimated to be approximately 95%.

The underlying cause of death is coded according to the 10th edition of the International Classification of Disease (ICD-10). This is a recent change in coding practice at the Alberta Cancer Registry. Deaths prior to 2001 were coded using ICD-9. The sites used in this report are based on groupings of ICD-10 or ICD-9, depending on the year of coding.

The Alberta Cancer Registry reviews the underlying and contributing cause(s) of death for all Albertans with a mention of cancer on the death certificate. If

the cause of death is inconsistent with the person's last known condition further information is requested.

Based on this information the underlying cause of death is reviewed and may be coded on the Registry as different from that appearing on the death certificate. In 1997, approximately 85% of deaths had the same ICD-9 three digit code, 5.4% were deemed to be in the same site (e.g. head and neck), and 3.1% were coded as primary unknown on one source and specific site on the other. In only 6% of deaths was there significant disagreement.

Use of Three-Year Averages

In all plots of trends over time, three-year averages are used to smooth out the effects of random year-to-year variation. These are calculated for frequencies by averaging the numbers over three-year periods centered on a given year, and for rates by summing the number of cases over the three years and dividing by the sum of the three mid-year populations. Averages are presented for 1981 to 2000 for incidence, and for 1988 to 2000 for mortality. These averages represent data from 1980 to 2001 for incidence and from 1987 to 2001 for mortality.

In the Regional Inserts, actual single-year data is used.

Statistical Methods

Average Number of New Cases and Deaths

Average numbers of cases and deaths are plotted to describe the trends in the total burden of cancer and also reflect the changes in population size and age structure. Three-year averages reduce the variability of statistics in the smaller regions and more accurately reflect the situation in RHAs, especially the smaller ones where year-to-year variability can be quite large.

Age-Specific Rates

Age-specific rates are calculated by dividing the number of incident cases or deaths occurring in a given period, in a given age group for a particular sex, by the corresponding age and sex specific Alberta population for the calendar period. Age-specific rates are expressed per 100,000 person years.

Age-Standardized Rates (ASIRs and ASMRs)

Age-standardized incidence and mortality rates are presented because rates vary with age. If the crude rates [total number of cancer cases/(total population x period of observation)] are used for comparison purposes, they will be affected by differing population age structures. Age-standardized rates estimate the average cancer incidence rate that would have occurred in a standard population if the actual age-specific rates within that region had prevailed in the standard population. To compare cancer incidence rates over time, or with other geographic areas, all rates to be compared should be standardized to the same standard population. The 1991 Canadian Census population is used as the standard population in the calculation of the age-standardized cancer incidence and mortality rates in this document.

In the June 2000 *Regional Picture* report, incidence rates for pediatric invasive cancer were standardized to the entire population. Consistent with the 2001 report, these incidence rates are now standardized to the pediatric population only, accounting for the apparent increase in rates for both males and females between reports.

Confidence Intervals for Rates

A confidence interval is indicative of the precision of the estimate and for these data is a reflection of the population size on which the estimate is based, and not on the quality of the data collected. The method of the binomial approximation for the standard errors has been used.

Cancer Trends

Certain determinants of the number of new cases have been examined. The changes in the number of new cases since 1988 have been decomposed into changes due to age structure, population growth, and changes in cancer rates. This has been carried out for each sex separately.

The baseline number of new cases (horizontal dotted line on page 15) is the number of new cases in 1988. The top line represents the actual number of new cases over time.

The middle line represents the number of new cases expected if the age distribution in Alberta in 1988 were held constant from 1988 to 2000. This is computed as the population in a year multiplied by the age-standardized rate for that year, where the rate is standardized to the 1988 population.

The lowest line represents the number of new cases expected if the age distribution and the overall population size in Alberta in 1988 were held constant from 1988 to 2000. This is computed as the 1988 population multiplied by the age-standardized rate for that year, where the rate is standardized to the 1988 population.

Survival Curves

Relative survival has been used in the analysis of the Alberta Cancer Registry data. Relative survival compares the observed survival of cancer patients with the expected survival of members of the population with the same age and sex characteristics. This approach is the preferred method of estimating disease-specific population-based survival since it does not depend on the accuracy of the death certificate cause of death. Throughout this publication, Hakulinen's method of calculating relative survival has been used. Provincial life tables, published by Statistics Canada, have been used to estimate expected survival.

To be consistent with other Canadian publications and to have comparable survival figures, the methodology and inclusion-exclusion criteria of the Canadian Cancer Survival Analysis Group (CCSAG) have been followed. Details of this methodology can be found in a recent Statistics Canada publication,* or by contacting any member of the CCSAG.

Projection of Cancer Incidence

The methods used to derive projections differ in this report from previous methods. Previously, only short-term projections were included and the methods used were based on linear trends in the rates. As the projections included in this report are 30 years into the future, the method used are based on recent average cancer rates.

The projection method estimates the average cancer rate from the five-year period 1996 to 2000 using the method. The differences in rates due to different age group structures have also been taken into account by estimating rates for four age groups: 0-44, 45-54, 55-64, and 65+. Therefore, the rate for each sex, site, age group, and RHA combination is estimated.

These estimated rates are assumed to prevail in the projection period from 2001 onward. These estimated rates are applied to the estimated RHA population figures (projected by Alberta Health & Wellness) to derive the sex, site, age group, and RHA specific numbers of new cases. RHA specific projections are obtained by aggregating over sex, site and age groups. Rates are expressed per 100,000 person-years.

* Ellison L., Gibbons L. and the Canadian Cancer Survival Analysis Group. Five-year relative survival from prostate, breast, colorectal and lung cancer. *Health Reports 2002*; 13(1): 1 - 12.

Resources for Health Professionals

General Prevention Resources

- **Prevention Link (February 2003)**
  A brochure for health professionals containing core messages and recommendations about general cancer prevention; healthy eating; physical activity; tobacco control; sun awareness; environmental carcinogens; breast cancer screening and cervical cancer screening.

- **A Snapshot of Cancer In Alberta (2001)**
  User-friendly Alberta cancer statistics as well as prevention information and initiatives.

Lifestyle Series Teaching Packages

A series of six teaching modules designed to help health professionals in RHAs to plan, implement and evaluate community activities and provide education on cancer prevention and early detection.

- **Healthy Lifestyles - Physical Activity**
- **Healthy Eating**
- **Cervical Cancer Screening & Prevention**
- **Breast Cancer & Breast Health**
- **Tobacco Reduction and Health**
- **Sun Sense**

Breast and Cervical Cancer Screening Resources

- **Breast Cancer Screening in Alberta - Women's Knowledge Attitudes and Behaviours (WKAB) Survey (2001)**
  This fact sheet highlights results about breast cancer screening participation, early detection and knowledge of risk factors generated following the 2000 WKAB Survey.

- ***Screen Test* and the 1999 AMA Clinical Practice Guidelines for the Early Detection of Breast Cancer**
  A two-page summary of *Screen Test's* practices in accordance with the 1999 AMA guidelines.

- **Chart Sticker**
  This sticker acts as a reminder and can be attached to the charts of patients who are in the appropriate age group to receive regular screening mammography.

- **Literature Review - Cervical and Breast Cancer Screening, Interventions for Under-served Populations, November 2002**
  A comprehensive document that reviews research literature since 1990 to determine effective strategies for increasing both breast and cervical cancer screening for women considered under-served or hard to reach.

- **Cervical Cancer Screening in Alberta - Women's Knowledge Attitudes and Behaviours (WKAB) Survey (2001)**
  A fact sheet that highlights results about cervical cancer and screening, including Pap test utilization, barriers and knowledge of risk reduction behaviours generated following the 2000 WKAB Survey.

- **Alberta Clinical Practice Guideline for Cervical Cancer Screening**
  A short document produced by the Alberta Medical Association in conjunction with the Alberta Cervical Cancer Screening Program that describes guidelines for those performing Pap smears.

- **Alberta Cervical Cancer Screening Program (ACCSP) Quick Reference Card**
  A two-sided reference card for health professionals that explains key cervical cancer screening information including Pap smear preparation, screening recommendations and follow-up of Pap smear results.

Nutritional/Healthy Eating Resources

- **Simply Healthy Vegetable and Fruit Community Action Resource Toolkit (March 2001)**
  A resource kit that assists RHA staff with developing community based nutrition projects that increase awareness about the value of consuming 5 to 10 vegetables and fruits daily.

- **Vegetable and Fruit Consumption in Alberta - Report on the Nutrition: Knowledge, Attitudes & Behaviours Survey (August 1999)**
  A report for RHA staff that highlights literature which links diet, especially consumption of vegetables and fruit, with cancer prevention and gives highlights of the baseline 1998/99 NKAB Survey

Tobacco Reduction/Prevention Resources

- **Alberta Teen Tobacco Reduction Project Report & Video (April 1999)**
  A report summarizing the social marketing project where teens in Northern communities developed television ads designed to encourage their peers to remain tobacco-free. (Note: The report is available in PDF format only from our website at http://www.cancerboard.ab.ca cancer/cancer_online.html. Copies of the video are available.)

Sun Protection Resources

- **Sun Safety in Alberta - Knowledge, Attitudes and Behaviours Survey in Headwaters Health Region (May 2003)**
  This fact sheet highlights the results of a sun safety survey among parents with children ages two to 12. The results include reasons that children don't follow sun protection guidelines and how much parents know about how to reduce the risk of sun exposure.

- **Sunright Sun Safety Policy Guide for Early Childcare Facilities (March 2003)**
  A guide to assist daycare or registered family homes with the development of a sun exposure policy and the education of staff and parents.

- **Sunright Sun Safety Policy Guide for Outdoor Workers (March 2003)**
  A guide to assist management of outdoor workers and workplaces with the development of a sun exposure policy and the education of staff.

- **Sunright Sun Safety Policy Guide for Youth Activities (March 2003)**
  A guide to assist sporting groups, camps, or similar organizations with the development of a sun exposure policy and the education of staff, volunteers and parents.

- **Healthy Living with Sunshine: An Information Kit for RHAs (March 2002)**
  An information package for RHA staff including sun safety messages, skin cancer detection, promotional fillers and more. (Note: This kit is available in PDF format only from our website at http://www.cancerboard.ab.ca/cancer/cancer_online.html.)

To Order Resources

All resources may be obtained by downloading them from the ACB website at http://www.cancerboard.ab.ca/cancer/cancer_online.html or by contacting the Prevention Team at prevention@cancerboard.ab.ca.

For More Information

For more information about the work of the Alberta Cancer Board and the services we offer, please visit our website at www.cancerboard.ab.ca.

We also welcome your comments about this report and value your suggestions for improvements. Please share your thoughts and ideas by emailing our offices at prevention@cancerboard.ab.ca.

Incidence and Mortality

- **Canadian Cancer Statistics 2003**
  Canadian Cancer Society / National Cancer Institute of Canada / Statistics Canada / Provincial/Territorial Cancer Registries / Health Canada

  These reports, published annually by Health Canada, examine incidence and mortality across Canada and the provinces. Different specialized topics are included each year.

- **Alberta Cancer Registry: Annual Report of Cancer Statistics, 2000. Preliminary data only (September 2002).**
  This document contains aggregate data on the incidence and mortality of cancer in the province of Alberta. This information is used by health professionals and policy makers.

Survival Analysis

- **Five-year relative survival from prostate, breast, colorectal and lung cancer**
  L.F. Ellison, L. Gibbons and the Canadian Cancer Survival Analysis Group. *Health Reports*, 2002, Vol. 13, No. 1

  Provincial variations in relative survival rates are examined. Breast, prostate, colorectal and lung cancers are considered.

Screening and Early Detection

- ***Screen Test*: Alberta Program for the Early Detection of Breast Cancer: 1999/01 Biennial Report**
  Division of Epidemiology, Prevention and Screening
  Alberta Cancer Board, March 2002

  This publication describes *Screen Test* activities throughout Alberta as well as regional information on screening.

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Alberta Cancer Board
Division of Population Health and Information
Holy Cross Site, 2202 - 2 Street S.W., Calgary, Alberta T2S 3C1 Tel: (403) 355-3270
Website: www.cancerboard.ab.ca